ngineering
Library

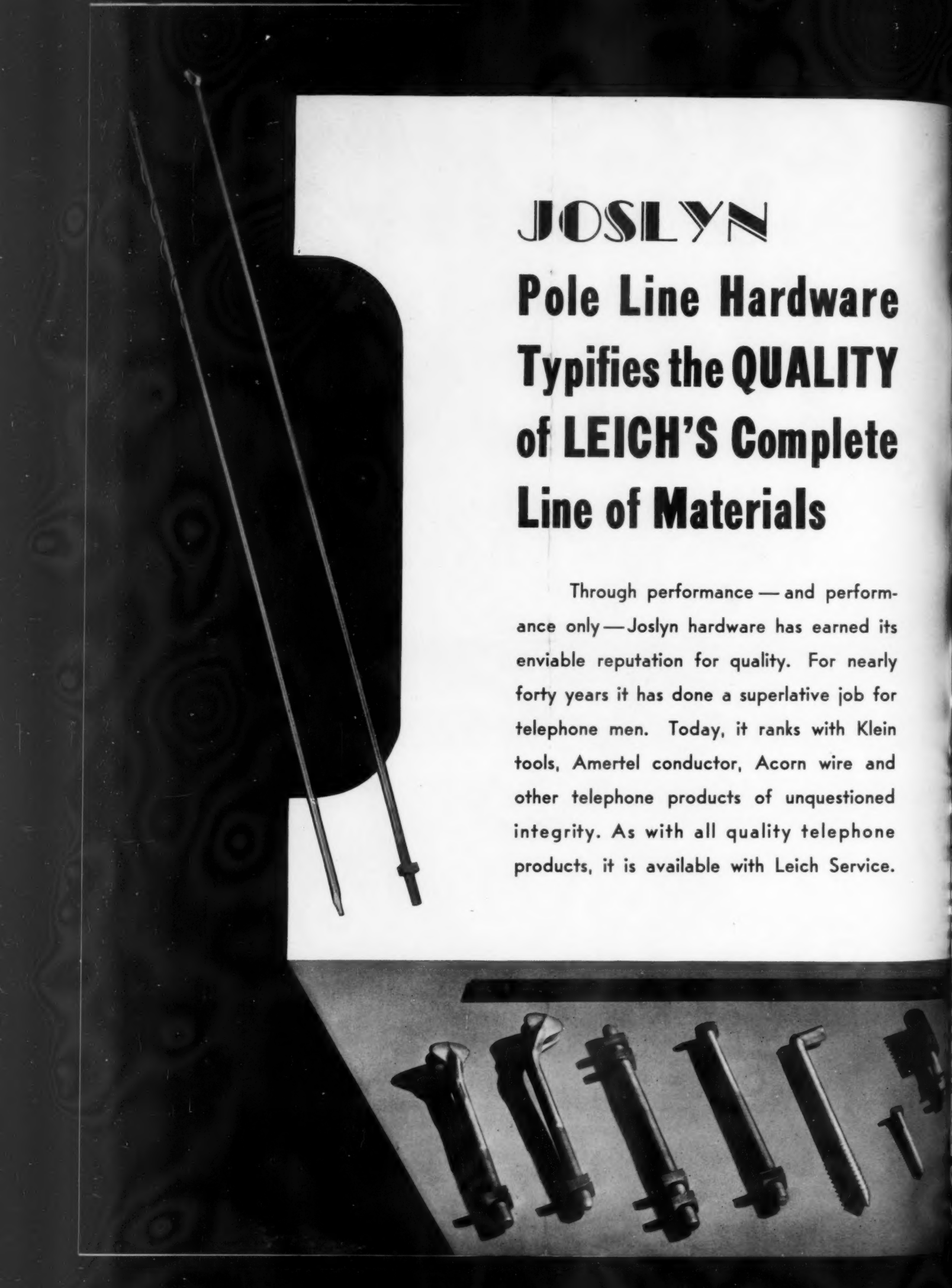
NOV 24 1941

# TELEPHONE ENGINEER

## AND MANAGEMENT

*The National Telephone Magazine*

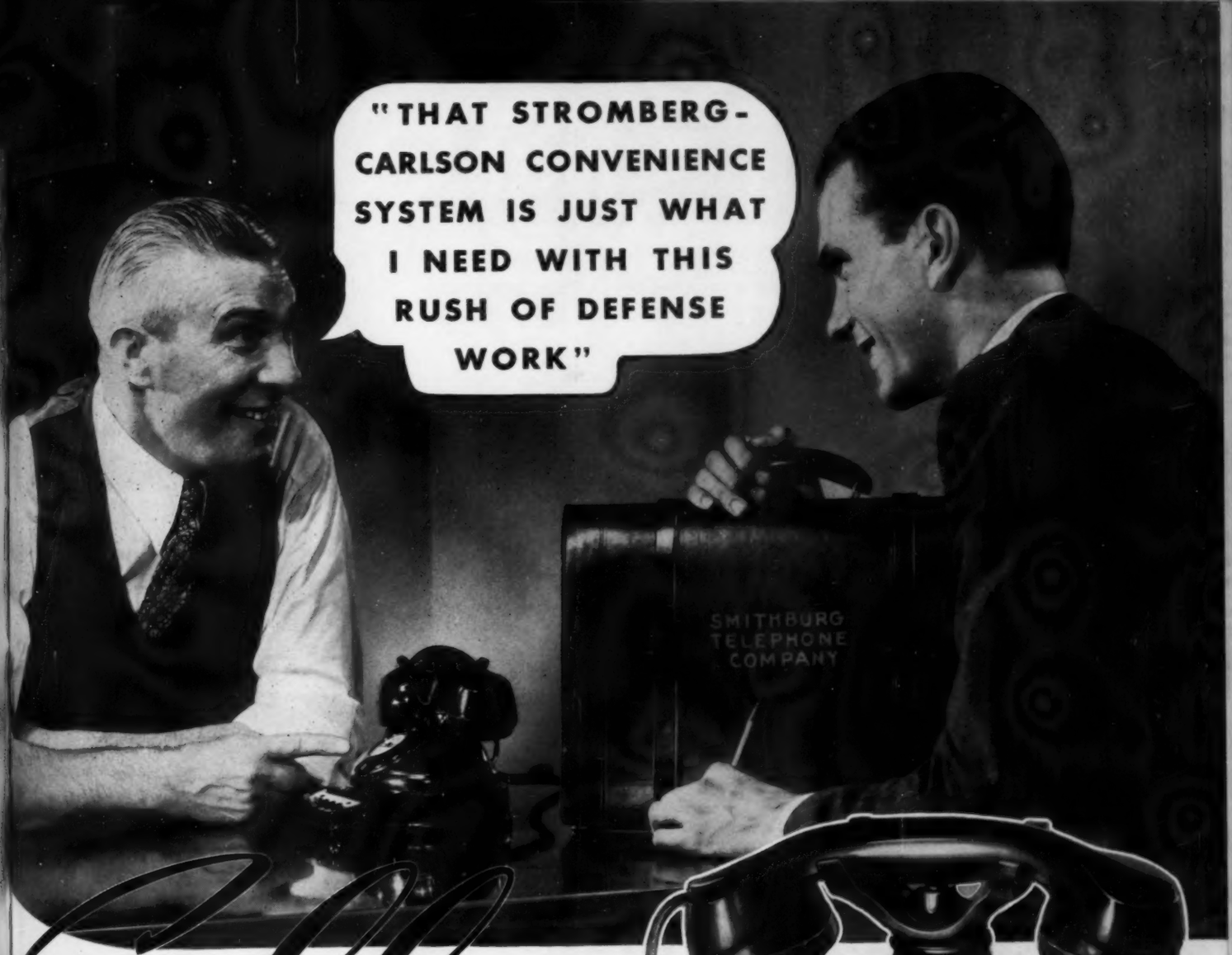
**NOVEMBER 15, 1941** Manual and Dial Comparative Cost Studies . . . News From Washington . . . Wire Chief's Training Course . . . Line and Desk . . . Quantitative Design By Jay G. Mitchell



# JOSLYN

# Pole Line Hardware Typifies the QUALITY of LEICH'S Complete Line of Materials

Through performance — and performance only — Joslyn hardware has earned its enviable reputation for quality. For nearly forty years it has done a superlative job for telephone men. Today, it ranks with Klein tools, Amertel conductor, Acorn wire and other telephone products of unquestioned integrity. As with all quality telephone products, it is available with Leich Service.


"THAT STROMBERG-CARLSON CONVENIENCE SYSTEM IS JUST WHAT I NEED WITH THIS RUSH OF DEFENSE WORK"
SMITHBURG TELEPHONE COMPANY

# Sell

## TROMBERG-CARLSON CONVENIENCE YSTEMS TO SMALL SHOPS EXPANDING OR DEFENSE WORK.

der the rush of defense work, small shops are growing. Many of em have grown to a point where they are too big for one or two ntral trunks and a few extensions. They need intercommunica- n facilities, yet they are not big enough for a P.B.X. board and operator.

mberg-Carlson Convenience Systems offer the answer to the blem. They permit instantaneous trunking from any station, rcommunication without the aid of an operator, 24-hour serv- ability to talk long distance from any station, and freedom from ble because of their simple, durable construction.

o types of station instruments are illustrated which are used h Stromberg-Carlson Convenience Systems — No. 1215 Type -button), and No. 1195 Type (8-button).

STROMBERG-CARLSON TELEPHONE MANUFACTURING COMPANY
Factory and General Offices: 100 Carlson Road, Rochester, N. Y., U. S. A.
Branch Offices: Chicago Kansas City San Francisco Toronto

Stromberg-Carlson Convenience Systems can be furnished with 1, 2, or 3 central office trunks and as many intercommunicating stations as there are further available buttons on the telephone selected.

ST Systems have selective talking and selective ringing with secret service on all connections. Other systems have selective ringing and common talking for intercommunication, with secret service on trunk connections.

# Stromberg-Carlson

KERS OF VOICE TRANSMISSION AND VOICE RECEPTION APPARATUS FOR FORTY-SIX YEARS

# TELEPHONE ENGINEER

MANAGEMENT • ENGINEERING • MAINTENANCE

"THE NATIONAL TELEPHONE MAGAZINE"
FOUNDED 1909

VOLUME 45—No. 11

NOVEMBER
1941


## CONTENTS


- Across the Editor's Desk ..... 9
- Highlights of the Communications News—by Roland C. Davies ..... 17
- Convention Dates ..... 18
- Trial Comparative Cost Studies—Manual to Dial—by Emmett D. Talbot ..... 19
- Wire Chief's Training Course ..... 21
- Quantitative Design of Central Office Equipment—by Jay G. Mitchell ..... 24
- Late News Stories ..... 26
- Line and Desk—edited by B. C. Burden ..... 32
- Long Lines—by R. A. Clark, Jr. ..... 34
- TELEPHONE ENGINEER Handbook Tables ..... 37
- Personals from the Field ..... 43
- Monthly Station Barometer ..... 45
- Index to Advertisers ..... 54



***The Staff***

RAY W. SMITH, Editor
ROY F. SMITH, Adv. Manager
B. C. BURDEN, Technical Editor
DON C. SORENSEN, Sales Prom. Mgr.
ISABEL RICE, Production Manager
V. R. LASKER, Circulation Manager



Office of publication, Pontiac, Illinois. Executive and Editorial Offices 7720 Sheridan Road, Chicago, Illinois. Phone Rogers Park 3040. Subscriptions: U. S., Cuba, Mexico, $1.50 Per Year; Canada, 2.00; In all Other Countries, $3.50. Single copies, U.S.A., 15 cents. All subscriptions should be sent DIRECT to 7720 Sheridan Rd.

Published Monthly by
**Telephone Engineer**
**Publishing Corporation**



Extra HOLDING POWER!

A COMPLETE LINE OF EVERSTICKS MEETS ALL CONSTRUCTION AND MAINTENANCE NEEDS.

For dependable anchoring with holding power always in excess of rated capacities to meet unusual strains.

15 sizes of 2-way, 3-way, 4-way types; also cone anchors, all made of best quality, tough, malleable iron . . . all with Everstick's exclusive nut housing feature.

EVERSTICK ANCHORS...

*Distributed by:*

**STROMBERG-CARLSON TELEPHONE MFG. CO.**

Factory and General Offices: 100 Carlson Rd., Rochester N. Y., U.S.A.
Branch Offices: Chicago • Kansas City • San Francisco • Toronto

Simplify Splicing
WITH THE NICOPRESS METHOD

Splices made with Nicopress sleeves and tools are tight as a weld, and the conductors will not pull out. They have a lasting high conductivity. They are exceptionally strong, exceeding the rated breaking strength of the conductors. Nicopress splices are easily made with the light, compact Nicopress tools. There is a Nicopress sleeve for practically all popular communication wire sizes.

*Distributed by:*

**STROMBERG-CARLSON TELEPHONE MFG. CO.**

Factory and General Offices: 100 Carlson Rd., Rochester N. Y., U.S.A.
Branch Offices: Chicago • Kansas City • San Francisco • Toronto

# ACROSS THE Editor's Desk

*We were looking to a nice weekend of golf at Excelsior Springs, Mo., last week with Charles Deering, Chet Ruth and several others and go from there to the Missouri Telephone Association convention and our annual visit with Bob Hedrick. The first snowfall of the year ruled out the golf in the west and several "news breaks" from the east made us stay on the job. We imagine the boys enjoyed the baths anyway. Thanks for the invite Chas.!*

▼

*We are glad to greet our old friend Emmett D. Talbot in this issue. It has been quite a long time since we have had an article from him but were pleased after we checked his manuscript and found his subject one that is timely, instructive and well presented. Emmett is a practicing Consulting Engineer of Rochester, New York, and is well known to the telephone industry. His article, to be presented in two parts, starts on page 19.*

▼

*Thank you Frank LaPrade for your nice words in your current Virginia Association Bulletin. We hope our story in the Nov. 1 number on the Amended P-22 Priority order will assist all of you operating telephone men. That was the news at the minute but later developments lead me to direct your attention to the story on Priorities in this issue. The situation changes from day to day.*

▼

*Crossing your fingers does not work. We tried it!*

*Ray*

**Tops** for long-span, low-cost construction . . . more dependable where ice and wind load is a factor . . . *Crapo* galvanized line wire meets every requirement for overhead lines. Bought "via GRAYBAR" it has double value, because of the added benefits of cooperative buying assistance and a one-call source of supply. It's easy to prove this to yourself . . . call GRAYBAR next time the need for line wire arises.

**Crapo HTL-135** . . . Combines a degree of physical strength and low electrical resistance never before available in a ferrous wire . . . permitting spans from 200 to 500 feet. Regularly furnished in No. 12 B.W.G. in continuous lengths. Write GRAYBAR for 19-page booklet, No. 202, which contains such valuable information as engineering data, construction practices.

**Crapo HTL-85** . . . A high-strength line wire for long spans, or for giving standard length spans extra strength to meet increased ice or wind loads. Available in sizes 9 to 14 B.W.G. Like HTL-135, it comes in continuous lengths with no splices or joints. Its transmission and signal qualities are excellent. Bulletin 201 will give you the complete story. Write GRAYBAR for your copy today.

**Crapo Galvanized Steel Strand** . . . Popular in the telephone field for many years. Available in all standard sizes and grades. Write GRAYBAR for full information.

*Branches in over 80 Principal Cities.*

GRAYBAR ELECTRIC COMPANY
*Executive Offices:*
Graybar Building, New York, N.Y.

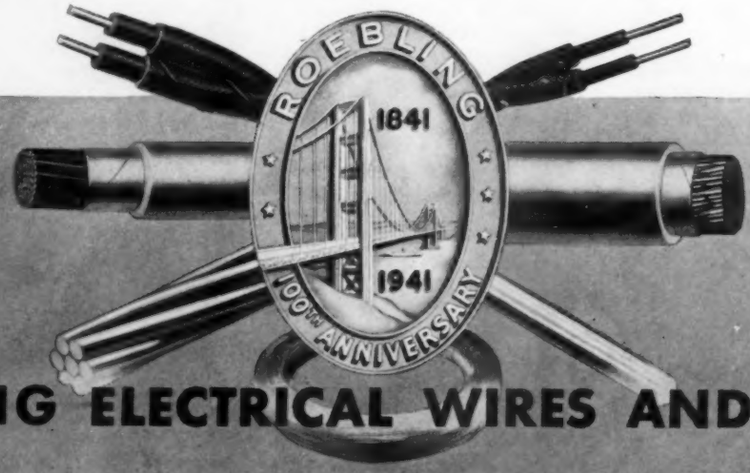
GraybaR QUALITY — Distributed by GraybaR ELECTRIC COMPANY

# ROEBLING *Looks Ahead*

## TO A SECOND CENTURY OF PIONEERING!

The past—despite its achievement—is *behind*. The opportunity to continue to grow, to further achieve, to serve industry in even greater measure, is *in the future*.

» » That is why Roebling—at the celebration of its 100th Anniversary—LOOKS AHEAD—looks ahead with confidence to new opportunities to Pioneer in Wire—new opportunities to develop the finest wire and wire products that aggressive research, unequalled experience, and the most modern of manufacturing facilities can make possible.




**ROEBLING ELECTRICAL WIRES AND CABLES**

JOHN A. ROEBLING'S SONS COMPANY

TRENTON, NEW JERSEY

# *Highlights* of the Communications News

## Important Communications developments of the past month, briefed for busy readers

by

ROLAND C. DAVIES
Editor, Telecommunications Reports

### *Priorities*

**DETERMINATION of the government machinery to handle the allocation and priority requirements of the communications industry, particularly the telephone industry, still remained unsettled as the Nov. 15 issue of TELEPHONE ENGINEER went to press, but the subject was felt to be in its final stages of solution in discussions between Chairman James Lawrence Fly of the Defense Communications Board and OPM Priorities Director Donald M. Nelson.**

Because the government defense authorities are now planning to shift from the present priorities method to a machinery of allocations of strategic metals and materials on the basis of industry-wide requirements, **the telephone industry may gain beneficial results through this move and a remedy of the troublesome situation which it has endured during the entire year with no special agency at OPM to handle its priority matters.** The telephone industry, both Bell System and Independents, has already prepared extensive forecasts of its needs for future periods, including the entire next year in strategic metals and materials, like copper, zinc, lead, rubber, etc. The allocation program is now being devised by the Supply Priorities and Allocations Board, which has directed its executive director to work out a 1942 program of materials requirements for each industry.

The past two weeks have been marked by a continuation of the confusing situation for the telephone industry leadership in regard to the designation of an agency to be specifically charged with the handling of communications priority problems. The Defense Communications Board, through its Priorities Liaison Committee, worked up a plan under which the DCB would be an advisory clearing house on communication priorities and the OPM, while leaning favorably to this idea at the outset, had not yet decided at TELEPHONE ENGINEER'S press time whether or not it would give such priority jurisdiction to an outside agency.

**THE telephone and telegraph industry, however, did receive some belated OPM recognition, when the OPM Power and Communications Branch, headed by former TVA Chief Engineer J. A. Krug, announced the issuance of a set of instructions for utilities, including the telephone industry, to be used in submitting project preference rating applications. It was stated by a top official of this branch of OPM that the telephone and telegraph industries were issued these instructions as an interim measure to serve until the position of the DCB is determined. If the DCB plan is not consummated, however, the Power and Communications Branch may be the medium which will be used by the OPM for the telephone industry.**

### Notice to All Independent Telephone Companies

**Just as we go to press we are informed that the United States Independent Telephone Association is sending to all Independent companies a very important questionnaire on the subject of scarce and vital materials used by and needed by Independent companies. We have been asked to urge every telephone company receiving this questionnaire to fill it in and return it to the Association at once, as the information being gathered in this matter is extremely necessary in the matter of obtaining allocations of such materials for use by Independent Companies.**

**Editor.**

### PRIORITIES

**The new amendments to Order P-22 amended issued Nov. 10 is discussed on page 26.**

### *Developments*

THE following loomed as prospective developments in the remedying of the telephone industry's solution of its priorities situation:

1. After the DCB Priorities Liaison Committee had held two important meetings during the last week of October with industry representatives of various branches of communications, with L. G. Woodford, American Telephone & Telegraph Chief Engineer and Louis Pitcher, U. S. Independent Telephone Association Executive Vice President, representing the telephone industry, the OPM and DCB leadership discussed a plan under which the DCB would set up a section which would serve as an advisory and recommendatory agency in determining the defense and priority rating status of the various services in the communications field. As a result of these discussions the OPM was slated to issue a directive giving the DCB this advisory authority. But obstacles in connection with the proper division of authority between OPM as the defense agency charged with the handling of priorities by Congressional statute and the DCB being established as an advisory agency then delayed the issuance of this directive.

ONE outlook was that the DCB may receive the assignment from OPM of acting as an expert advisory agency in weighing the defense relationships of various types of telephone service and other branches of communications. However, it seemed practically certain that the OPM Priorities Division would retain authority over the implementing and authorization of strategic metals and materials to be given the telephone industry both for its defense and civilian operations.

2. While the program of rationing of power, instituted by the OPM in the Southeast, inspired thoughts of the possibility of rationing of telephone service—a prospect which may be forced by lack of materials and facilities—there seems little likelihood, at least under present prospects, that any plan of nationwide rationing of telephone service is being thought of as a possible development. It must be remembered that rationing of service or

supplies to the public, unless instituted due to imperative necessity, arouses public resentment. This was true in the case of the gasoline rationing scheme in the East, inaugurated by Secretary Ickes, which failed because it was placed in effect before the actual need had arisen. The OPM power authorities, led by Mr. Krug, have apparently recognized such a public reaction because the power rationing has already been postponed and may never be instituted in full effect, if the drought situation clears up so the hydroelectric facilities can function at complete efficiency.

### *Rationing Service*

**THEREFORE, in regard to rationing of telephone service, the prospect is that any such rationing would be instituted by sections or regions rather than on a national basis. If any such sectional or regional rationing should come, it would occur when the plant facilities became tight, due to lack of materials for expansion. So far, no governmental machinery to order rationings of services like telephone has been established, but it appears likely that the same path, through OPM or SPAB, as was followed in the Southeastern power rationing, would be instituted. The authorizing Federal agency, it is presumed, would secure the cooperation of state commissions in having any telephone service rationing inaugurated in a statutory manner.**

### *Durr Inducted as FCC Commissioner*

**THE Federal Communications Commission now has its full complement of Commissioners with the addition of Clifford Judkins Durr, Alabama Democrat and brother-in-law of U. S. Supreme Court Associate Justice Hugo Black, Mr. Durr, who took the FFC post vacated by the retirement of Frederick I. Thompson, also of Alabama, came to the Commission from the Reconstruction Finance Corporation where he was Assistant General Counsel and General Counsel of the RFC's Defense Plant Corporation.**

The new Commissioner, who is 42 years of age, was inducted into office Nov. 1 with the oath administered by Justice Black. He is not commencing active participation in the FCC affairs until the latter part of November because he left Washington on a brief vacation soon after his induction.

The new FCC Commissioner is highly regarded in Administration circles for his legal ability, intelligence and energy. While he has no background in communications, he has stressed that he will study thoroughly any questions arising before the Commission and will approach all issues with an open mind.

Mr. Durr is a graduate of the University of Alabama and also took his legal education at Oxford University in England where he was a Rhodes scholar. He practiced law in Montgomery, Ala., and Milwaukee before he entered the government service.

## Convention Dates

**Tennessee Independent Telephone Association, Hermitage Hotel, Nashville, November 17 and 18.**

**Kentucky Independent Telephone Association, Brown Hotel, Louisville, December 12 and 13.**

**Minnesota Telephone Association, Radisson Hotel, Minneapolis, January 27, 28 and 29.**

### *Expands Activities*

**A NUMBER of highly important and far-reaching activities have been instituted by Major General Dawson Olmstead, Chief Signal Officer of the Army, to meet the exigencies of the huge expansion of the Signal Corps functions in national defense preparedness. These activities which have been set into motion in the past few weeks by General Olmstead and his headquarters staff in the War Department are known to have won the commendation of the Secretary of War and Under-secretary of War and the General Staff of the Army.**

Retiring president of the South Carolina association, Frank S. Barnes, delivering his address at their recent convention.

The Signal Corps today is probably the largest purchaser of communications equipment not only in the United States but also in the world—during the current fiscal year it will buy more than a billion dollars worth of equipment, spending $600,000,000 for radio apparatus and over $400,000,000 for telephone, telegraph and sound equipment. For example, the requirements for telephone wire for combat field use by the Army are three times the supply used in the first world war, so far over 300,000 miles of field wire having been purchased and one-half of that requirement already having been delivered. The monthly capacity of the wire manufacturers has been increased to over 25,000 miles as compared with a 1,500 mile production capacity in 1938.

**Each week an average of $40,000,000 in equipment contracts is being consummated by the Signal Corps. Showing that the communications manufacturing industry is meeting this test, the shipments of equipment to troops in the field has been steadily rising so that they are more than double a year ago and deficiencies in a number of lines of specialized apparatus types have been greatly curtailed.**

General Olmstead also has instituted an important study and review of combat communications needs with a major objective to simplify and reduce the number of designs of radio and telephone apparatus. To work out solutions along this line, a Military and a Civilian Advisory Boards have been set up to make continuous recommendations to the General Staff. The Military Board is composed of the leading communications officers of all the combat branches of the Army, Air Corps, Armored Force, Coast Artillery, Field Artillery, Infantry and Cavalry, together with liaison officers from the Navy and Marine Corps. The Civilian Advisory Board is composed of outstanding communications scientists, including Dr. Frank B. Jewett, Chairman of the Bell Telephone Laboratories, Dr. W. G. R. Baker, General Electric Radio-Television Vice President, RCA Manufacturing Director of Special Apparatus, John D. Coleman, Bendix Vice President, William Hillard and FM inventor Major E. H. Armstrong.

### *Commence Formulation of Continuing Property Record Rules*

THE FCC and the National Association of Railroad and Utilities Commissioners' Accounting Committee during the latter part of November will commence intensive study of the proposal to institute a continuing property record

(Please turn to page 46)

# Trial Comparative Cost Studies Manual to Dial Conversion

(FIRST OF TWO PARTS)

By EMMETT D. TALBOT
Consulting Telephone Engineer
Rochester, N. Y.

THERE is a tendency today, on the part of some Telephone Companies operating small magneto and common battery systems to the belief that the conversion of the small magneto or common battery system to dial operation will solve all of their operating problems. Companies in this class notice that the larger operating units are converting many of their existing manual systems to dial operation and decide that they too should change to dial operation, purely on the basis that in order to be in step with the times they should throw out the existing equipment and install dial apparatus.

It frequently happens that this procedure is followed without giving much if any consideration to the economic side of the problem. A Telephone Company that endures operates on the basis of, "Seeing To It," that there is a fair and safe margin of income left, after paying the operating expenses, to take care of the depreciation of the plant, taxes, interest on the capital invested and some for the surplus account to take care of future unfavorable contingencies.

The small Telephone Companies' income consists mainly of Exchange and Toll Revenue—the amount of Exchange Revenue to be obtained from a small operating unit of say 300 to 500 stations is limited by proscribed telephone rates. The Toll Revenue for a given small company is also somewhat limited, particularly if the toll service is furnished by a larger operating company. In other words, revenue is rather definitely controlled for a given sized area. Operating expenses however are subject to greater fluctuations. It is generally true that careful watchfullness on the part of the management of the operating costs, to keep them as low as possible, consistent with the rendering of a satisfactory service will determine the margin of safety between income and expense.

Many operating companies have increased or at least maintained a satisfactory operating margin of profit by the conversion of existing manual systems to dial operation. There are some cases, however, where an existing system has been converted to dial operation without giving proper study to the problem, which after conversion resulted in higher operating costs than existed under the Manual Operating Plan.

It is the purpose of this discussion to emphasize the importance of making sure that a conversion "Will Prove In" financially before the job is undertaken, and to outline a simple method that may be followed by the smaller operating companies in order to determinie approximately the amount of money that can safely be expended for dial equipment so that the total operating costs will be no greater than those existing or forecast for the present system.

GENERALLY, a cost comparative study of an existing manual and a proposed dial system consists of:

1. The First Cost of all similar plant items for the two systems being compared.
2. The annual charges based on the First Cost.
3. The operating expenses for each of the two types of systems.

**The Principle Items of First Cost Are:**

| First Cost | Existing Manual System | Proposed Dial System |
|---|---|---|
| 1. Land and Building | $ | $ |
| 2. Central Office Equipment | $ | $ |
| 3. Outside Cable and Wire Plant | $ | $ |
| 4. Subscribers' Station Apparatus | $ | $ |
| Total First Cost | | |

**Annual Charges Based On First Cost**

The annual charges based on the First Cost should be computed as follows:

**1. Land and Building**

| | Land | Building |
|---|---|---|
| Depreciation | — | 3.0% |
| Taxes | 2.0% | 2.0 |
| Interest on Investment | 5.0 | 5.0 |
| Total Per Cent Annual Charges | 7.0% | 10.0% |

The percentages used herein are for illustration only, as these percentages vary considerably for different operating companies.

**2. Central Office Equipment**

| | Existing Manual | Proposed Dial |
|---|---|---|
| Depreciation | 5.4% | 5.4% |
| Taxes | 3.2 | 3.2 |

| | | |
|---|---|---|
| Insurance | 0.3 | 0.3 |
| Interest on Investment | 5.0 | 5.0 |
| Maintenance is sometimes included as part of the annual charges. It is, however, the better practice to include Maintenance as an operating expense. | — | — |
| Total Annual Charge | 13.9% | 13.9% |

3. **Outside Cable and Wire Plant**

The First Cost of outside cable and wire plant should include that part of the plant required to be built to tie the proposed dial system to the existing plant.

The annual charge on the new plant required, will consist of:

| | Dial |
|---|---|
| Depreciation | 3.0% |
| Taxes | 2.0 |
| Interest | 5.0 |
| Maintenance | 1.0 |
| Total Annual Charge | 11.0% |

4. **Subscribers' Station Apparatus**

| | Existing Manual | Proposed Dial |
|---|---|---|
| Depreciation | 6.0% | 6.0% |
| Taxes (If any) | 3.2 | 3.2 |
| Insurance (if any) | — | — |
| Int. on Investment | 5.0 | 5.0 |
| Maintenance — generally this item is included in the operating expense. | — | — |
| Total Annual Charges | 14.2% | 14.2% |

**Operating Expenses**

| | Existing Manual | Proposed Dial |
|---|---|---|
| 1. Operators' Salaries and Taxes | $ | $ |

2. Central Office Maintenance*
3. Rental of Central Office and quarters where the company does not own the building.
4. Central Office Lighting and Power*
5. Outside Plant Maintenance*
6. Subscribers' Station Maintenance*
7. Dry Batteries (Magneto Telephones)
8. Amortization — Non-Recurrent Expense
9. Amortization—Plant Retired (Unaccrued Depreciation)
10. Total Operating Expenses

The items marked * are excess, not totals. For example, Item 5, Subscribers' Station Maintenance would include only the additional cost (if any) of maintaining the dial of the subscribers' set. It is generally assumed that otherwise the maintenance cost will be the same.

7—Dry Batteries—If the conversion is from a magneto to a dial, then the annual cost for dry batteries should be included as an item of operating cost for the existing manual system.

8—Amortization—Non-Recurrent Expense. There are some items of cost that enter into a conversion job that are non-recurrent. For example, in converting a magneto system to a dial system the magneto telephones must be replaced with dial telephones. The cost of placing the dial telephone is a non-recurrent expense item, Publicity previous to a cut-over to dial operation is also a non-recurrent expense item. Generally the non-recurrent expenses where the amounts are fairly large are amortized over a ten year period.

9—Amortization—Plant Retired. In the conversion to dial operation there are often items of plant which have to be removed and retired that are not fully depreciated. The unaccured portion of such plant retired is as a rule amortized over a ten year period so far as the items are concerned in the comparatitve cost study. In actual practice when these items are of small amount they are written off at the time of conversion.

In so far as this discussion is concerned and in applying the method outlined in order to determine the principle items of costs, the amortization of non-recurrent expense and unaccrued plant depreciation can be disregarded.

The above covers the main items of First Cost, Annual Charges and Operating Expenses that should be considered in determining the comparative cost of the two systems.

TO make a comprehensive comparative cost study involves considerable engineering work to be done before the study can be made. Further, after the engineering work is completed prices covering the dial central office equipment must be obtained from a supplier.

The smaller companies who believe there might be a cost justification in converting an existing system to dial operation can without making a complete cost study and at small cost, determine if a conversion is justified. If it is, then it is time to make a complete cost study and do the necessary engineering work required. The following procedure is suggested as a guide in making a trial cost study.

Tabulate the Book Values—First Cost of the present Manual System on a summary sheet made up to suit the conditions as follows:

1. **Land and Building.**

If the Company owns the land and building enter the book cost for the

(Please turn to page 30)

Smiling Edmund D. Kennedy joins in the "photo" fun with Mr. and Mrs. McClusky of Rock Creek, Ohio at the Copperweld exhibit during the recent National Convention in Chicago.

In one of the groups waiting for an "up" car, to take them to the meetings in the Tower room at the Stevens Hotel in Chicago, were George Butler and Herb Couch, secretaries of the Texas and Kansas Associations, respectively.

# Wire Chief's TRAINING COURSE

SECTION IX

## Open Wire Construction (Part 3)

*(Prepared Expressly for TELEPHONE ENGINEER by the Lincoln Engineering School)*

### *Open Wire Placement*

AFTER the pole line is erected and crossarms or brackets placed, the lead is ready for wire stringing. This is an important phase of outside plant work for unless carefully done an excessive amount of future line trouble may result. Wire stringing also requires that precautions be taken to avoid hazards to the public at points where wires are strung over roadways.

The placing of open wire involves the following operations:

A—Pulling in the wire
B—Carrying it up the pole*
C—Pulling slack
D—Placing line wire ties

*—Unless it is pulled in over the arms.

A principal consideration in the placing of open wire is to avoid possible injury to the public or to those engaged in the wire stringing operations. Hazards result from the wires, which are being pulled in, getting down across highways, or making contact with power wires. Even though power wires are above telephone circuits, this does not eliminate the possibility of electric contact as cases are on record where a telephone wire has been thrown into a power wire due to the wire sagging across a highway and being hit by a passing auto which threw the wire into high voltage power wires resulting in the electrocution of a lineman engaged in the wire stringing operation.

Where wires are being pulled across highways or private driveways, a man equipped with warning flags should be stationed at the crossing to warn approaching motorists. Wherever it is

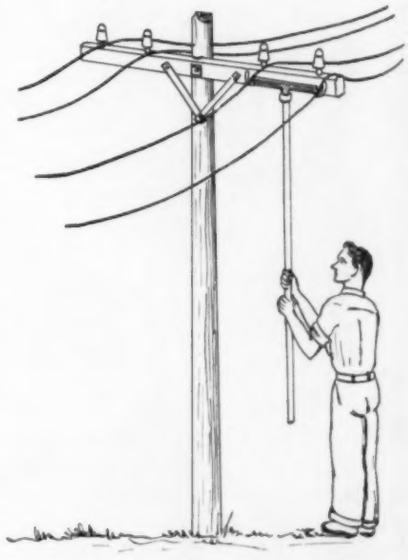


Fig. 2—Use of Raising Fork on Short Poles

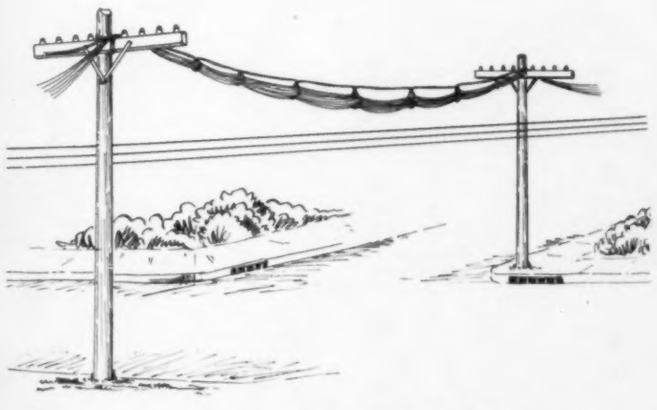


Fig 1—Use of Rope Sling in Stringing Telephone Wires over Power Wires.

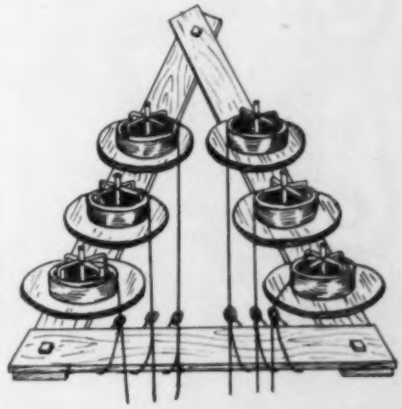


Fig 3—Arrangement of Reels for Pulling In Five Wires

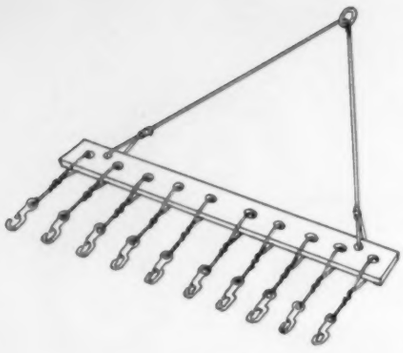


Fig. 4—Homemade Pulling In Board

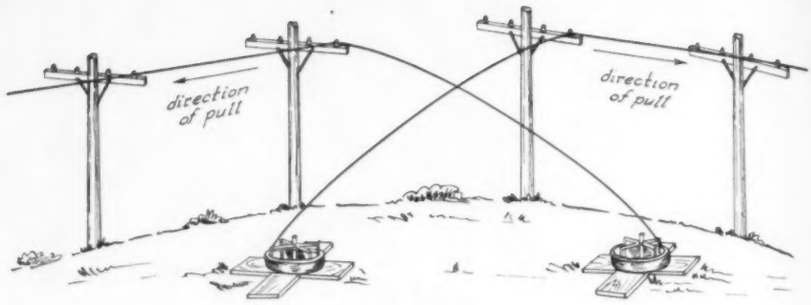



Fig. 6—Typical Reel Set-up

necessary to string wires across power wires, especially those of more than 220 volts, rope sling such as that shown in Fig. 1 should be used to avoid any possibility of contact.

### *Pulling in the Wire*

THE usual method of open wire placement is to pull the wire or wires out along the pole line from stationary reels. After a section of wire is strung out it is carried up the pole and placed over the cross arm (or brackets). In some cases on short poles, a **raising fork** such as that shown in Fig. 2 is used to raise the wires in place.

Where there is more than one or two wires to be pulled in considerable time will be saved if several reels are available so that all of the wires can be pulled in at one time. Fig. 3 shows the arrangement of stationary reels when as many as six wires are being placed. Where the ground is hilly it may not be feasible to use a stationary reel setup and in such cases where the roadside is clear the reels are placed on a truck which is driven slowly along the route of the pole line thus paying out the wire from the reels.

To help keep the wires in order when several are being strung at one time, a **pulling-in board** as shown in Fig. 4 should be used. A stout oak board 1" x 2" x 2' will be amply strong for this purpose. Ordinary harness snaps can be used to hold the wires by twisting a loop in the wire ends. If the wires are layed over the crossarms and transpositions are thrown in as the wire is pulled out, the wires can readily be interchanged at the transposition points by merely unsnapping the wires and shifting them to the opposite position. This practice of transposing as the wires are pulled in is preferable to pulling the wires in straight and then cutting in the transpositions after they are in place. This latter method results in unnecessary line splices.

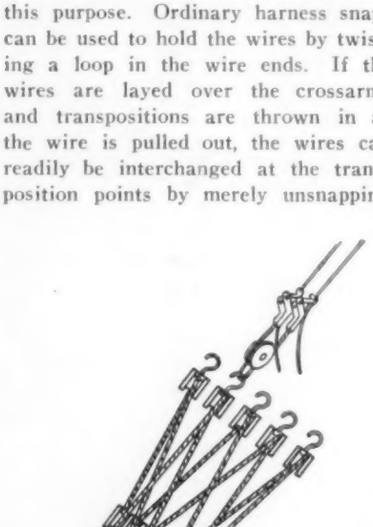


Fig 8—Equalizer for Ten Wires

The Bell System makes use of a special metal running board equipped with swivels which permit both physical and phantom transpositions to be thrown in, as the wires are pulled out, by merely turning the swivels. A device of this type is shown in Figure 5. This type of tool is particularly useful where phantom groups are being strung.

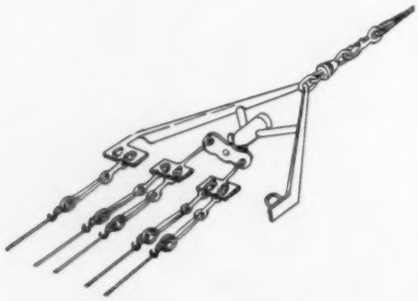


Fig. 5—Device used by Bell System for Pulling In Wires

### *Reel Set-up*

TELEPHONE wire is available in one half mile coils, hence the maximum pull without a splice is confined to this length. Whether or not a full coil (one half mile) of wire can be pulled in with a single reel set-up will depend largely on the contour of the ground, intervening corners, interference with traffic, etc.

In general, where these reels are to remain at one point (the usual method) they should be set up at the highest point in a one mile section of line. The wires should then be pulled out in each direction from this location as is shown by Fig. 6. The wires may be either pulled out along the base of the pole lead or pulled in over the crossarms, whichever method seems best suited to the conditions encountered. If there are no obstructions, it is usually preferable to pull the wires out along the poles.

Whichever method is used be sure that the wires being pulled in do not create a hazard to the public at road crossing points.

After the wires have been pulled in thru the first section and are in place on the crossarm, a deadend or snub grip should be placed on the line wires at the distant end of the first section and the wires pulled up to proper tension at the reel point, a snub grip should be placed on each wire to hold the tension.

Next pull in the second section. When this section is in place splice the reel end of the wire extending in the

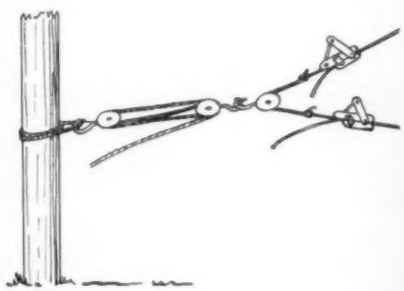


Fig. 7—Simple Equalizer for Two Wires

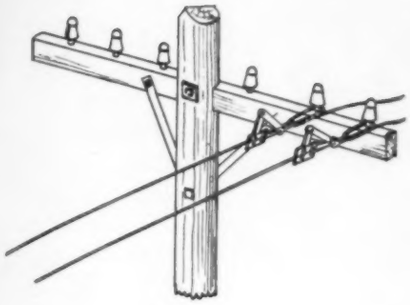


Fig. 9—Snub Grips for Temporarily Holding Tension

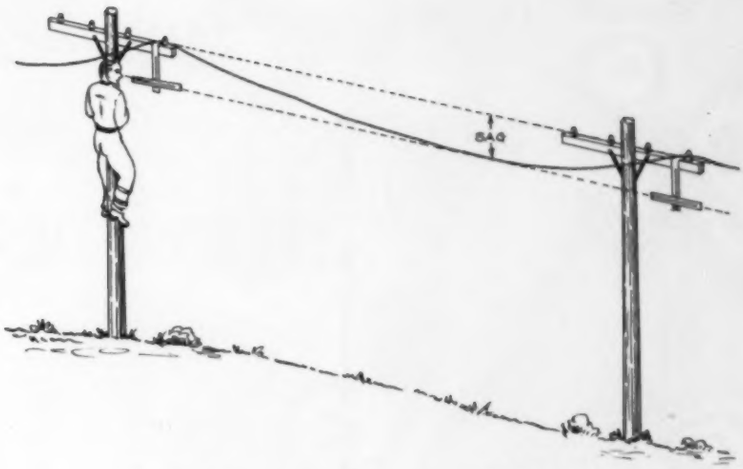



Fig. 10—Measurement of Sag on Level Section

opposite direction and pull tension in the second section toward the far end and snub or deadend if it is the end of the line. Tie in the first and second section.

Temporary guys should be placed on the intermediate pole at which the strain is held and later removed when all tie wires have been placed.

### *Alternate Method*

ANOTHER method of wire stringing which is quite popular is to set the reels up at the beginning of the lead and pull in a full coil length of wire. The wires are then permanently dead ended at the starting point. The reel is moved ahead to the end of the first section and at this point a temporary deadend guy is placed on the last pole of the first section and slack pulled. The tension is held by snubbing grips. If the crew is sufficiently large, tieing in on the first section should proceed while the second section of wire is being placed. When the second pull has been completed the two wire ends are spliced and slack pulled in, the second section and the snub grips then removed at the end of the first section. This section is then "tied in" while the reels are moved ahead to repeat the operation just described.

Reel setups should be as close as possible to railroad and highway crossings as this gives the reel operators a better chance to observe traffic and to see that wires are being strung so as to provide proper clearance.

Wire should be carefully handled to avoid cuts or kinks that might later result in a broken wire.

### *Use of Slack Equalizer*

WHEN pulling slack on several wires on a lead more uniform results will be obtained if slack equalizers are used to insure that all wires will have equal tension.

A single sheave pulley and two wire grips arranged as shown in Figure 7 makes an excellent equalizer for two wires. When ten wires are involved an arrangement as shown in Fig. 8 will insure that all ten wires will have the same tension.

Similar combinations can be made up for 4, 6 or 8 wires using a two, three and four sheave block respectively.

For temporarily holding tension, wire grips equipped with a short rope or wire loop and used as shown in Figure 9 is very handy and will save considerable time over the making of a temporary deadend.

### *Sag Measurement*

IT is important that open wires be given the proper sag for wires that are pulled up too tight are likely to break during storm loading conditions and wires with too much sag result in excessive maintenance due to shorts and crosses.

The usual method of measuring sag is to sight between calibrated targets placed on adjacent poles as shown in Fig. 10. The crossbars of the targets are set to the desired sag and the wire tension adjusted to the point where the wire falls in the line of sight at the middle of the span. When sighting in the sag on a grade the sag is of course measured at point of maximum sag as shown in Fig. 11.

The amount of sag to be given new wires will depend on the type of wire, the stringing temperature, the length of span, and loading district. In general the longer the span and the heavier the storm loading, the greater the sag required.

The relationship between sag, tension, span length, and conductor weight is expressed by the equation: $t = \frac{S^2W}{8d}$ When t = tension in lbs., S = span length in feet, W = weight of conductor per foot, and d = sag in feet.

It is instructive to apply this formula to an open wire span having normal sag and to one with inadequate sag in order to appreciate the need for proper sag.

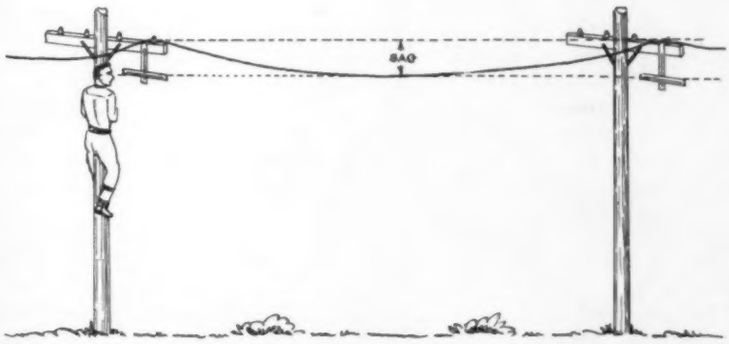



Fig. 11—Measurement of Sag on Hilly Section

(Please turn to page 36)

# QUANTITATIVE DESIGN OF CENTRAL OFFICE EQUIPMENT FOR SMALLER TELEPHONE OFFICES

**(Continued)**

By JAY G. MITCHELL

**How much of each element of the Central Office Equipment should be installed when the telephone office is being established new or is being modernized to replace an obsolete type—What is to be the method of determining the demands for service that must be met—Controlling factors—Functions of the Main Distributing Frame—Amount of excess capacity in iron work—Wall types—New cable terminal type—Type "A" and type "B" Main Distributing Frames—Factor determining size and capacity—Use of floor plan and templates to work out arrangement of equipment—typical layout of commercial M.D.F.**

### *Main Distributing Frame*

SUBSCRIBERS' and other telephone circuits entering the central office are terminated on the Main Distributing Frame. In all its form this portion of the Central Office Equipment is necessary in order to provide for the following:

A. Terminals for all the outside cable conductors in orderly and convenient arrangement.

B. Facilities by which the distribution of the outside circuits among their proper switching equipment units and the assignment of telephone numbers may be conveniently and securely carried out.

C. A point in each telephone circuit of uniform character and method of designation at which the circuit may be sectionalized for test.

D. Facilities for orderly mounting and numbering of the devices which are designed to afford protection to the switching equipment against damage by abnormal and destructive extraneous currents.

E. Terminals for all the cable conductors leading to the switching equipment units in orderly and convenient arrangement.

F. Support for the short links (jumper wires) of each circuit which effect the interconnection between the outside circuits and the units of the switching equipment.

G. Ground connection of low resistance to insure effective operation of the protective devices.

A revolving giant model of a new Stromberg-Carlson handset is being displayed at the recent National Independent Telephone Convention by W. L. Mollands and E. A. Reinke to H. F. Conley, P. F. Sigmans, and A. W. Anders of Tampa, Fla.

Regardless of which manufacturer may supply the Main Distributing Frame, it is obvious that the quantitative design must be based on "A" above. The number of cable conductors for which terminals are to be provided fixes the capacity of the supporting part of the iron work of this portion of the Central Office Equipment. When the floor type of frame is specified it is advisable, in the opinion of the author, to install enough of the iron framework to accomodate, in later additions, twenty per cent more cable conductors than are to be terminated initially. Of course in some cases, especially in new offices, cable switches which are contemplated may make it necessary to install even more than twenty per cent excess iron work capacity. Such especial conditions must, of course, be taken into account in listing the requirements. When such excess capacity in iron work is initially necessary it **must occupy needed floor space** even if removable later. In **every** Main Distributing Frame the number of cable pairs to be terminated fixes the capacity of iron framework immediately to be in-

stalled and in offices where a floor type Main Distributing Frame is to be used the iron framework provided should be of somewhat greater capacity, as explained, than is indicated by the initial number of cable pairs to be terminated.

In small telephone offices serving less than 150 line circuits, and in some larger offices the Main Distributing Frame is often of the type designed to be mounted on the wall. When this is the case considerable floor space is saved and many of the problems associated with the floor type of Main Distributing Frame are absent. In wall type Main Distributing Frames there has recently been placed on the market a very compact arrangement consisting basically of a cable terminal of the protected type with demountable protector units and with a terminal block mounted on the top for the cable conductors leading to the switching equipment. The outside paper insulated cable conductors, in this device are terminated in studs without requiring any tipping cable through the technique of a self soldering nozzle. The protection is made up in one pair units and consists of fuse and discharge gap to be secured by machine screws to the insulated studs in the wall of the terminal terminating the cable conductors. The cable terminal part of this device must, of course, be of the proper capacity to terminate all the incoming cable pairs. The number of pairs of protection, however, which must be provided is fixed by the number of circuits which it is intended to put into service. As the number of circuits in service is increased additional protection can be installed very easily in units of one pair. An interesting feature of this line of equipment is that the protection, being of the unit pair type, has been so designed as to permit of its use in a coordinated line of substation protectors and outside cable terminals. Developed primarily as a simple and universal type of protection this type of main frame equipment can be secured in units of 26, 52 and 104 pairs for small telephone offices.

THERE are two types of Main Distributing Frame and the type selected for a given office will have a very important effect on the capacity of iron work which must be provided. Considerations which dictate which type is to be used are very important and must be given most careful consideration, of course, but are of interest here only because of their effect upon the quantitative design of the iron work of the Main Distributing Frame. The two possible characteristic arrangements of the Main Distributing Frame in any telephone office are:

Type "A" In this type the cable entering the office is terminated on line terminals and the cable leading to the switching equipment is terminated on protectors.

Type "B" In this type the cable entering the office is terminated on protectors and the cable leading to the switching equipment is terminated on terminal blocks.

One of the supply exhibits of the Leich Sales Corporation.

IN type "A" Main Distributing Frames it is obvious that the iron framework capacity is fixed by the number of line terminals that must be provided for the incoming cable pairs. In type "B" it is obvious that the iron framework capacity will be dependent upon the number of protectors required for terminating the incoming cables. The problem is complicated also by the fact that individual engineers may insist upon either vertical or horizontal terminal blocks in either type "A" or type "B", in any event the protectors are always mounted in vertical rows whether they form the terminals of the incoming cable pairs (type "B") or of the cables leading to the switching equipment (type "A"). Except in large offices it is generally inadvisable in the author's opinion, to install protectors more than 200 pairs high and if there is sufficient space available then it would be much better to install the protectors in vertical strips of less than 200 pairs. Having these considerations in mind it is easy to so design the Main Distributing Frame ironwork as to provide about twenty per cent more capacity in **iron work** than is **immediately required** to terminate the outside cables entering the office. In the case of the type "A" Main Distributing Frame this capacity in iron framework will be dictated by the line terminals required and in the case of the type "B" Main Distributing Frame it will be dictated by the number of protectors required for the outside cables and by the possible height to which the protectors may be extended. With these several things decided it will be in order to secure from the manufacturer selected a drawing showing the dimensions of the required iron framework to meet the conditions. This drawing or sketch is to be employed in the making of a cardboard template, as will be described, in working up the floor plan of the proposed office. In the case of an entirely new building several of the factors mentioned will undoubtedly be incorporated in the building plans. These factors are such things as the height of the ceilings, the length and breadth of the several rooms and the location of the cable openings in walls and floors. It is true, however, that many telephone offices are installed in buildings that are not new and which are rebuilt either not at all or only partially. When this is the case the equipment must be adapted to the building and the placing of the various elements becomes a matter of careful utilization of available head room and floor space. For preliminary study, therefore, it is very helpful to cut out cardboard templates on the **same scale as the floor plan** to represent the distributing frame, the switching equipment, the desk equipment (chief operator and wire chief), the relay rack, the power switchboard, the toll switchboard and any other items of the apparatus and equipment that must be included and adapted to the space available. These small scale templates can then be easily

Walter Dakin and J. C. O'Connell of Madison, Wisc. Frank LaPrade (from Virginia, suh!) is on right.

(Please turn to page 31)

# Another Amendment to P-22 Priority Order Issued By OPM

An important OPM announcement relating to amendments to Amended Order P-22 was issued November 10. The order carried four amendments to the original order P-22 Amended which was carried in full in the November 1 issue of Fortnightly TELEPHONE ENGINEER. It is hoped our readers have this issue on file for ready reference that the amendments might be noted.

Perhaps the most important amendment in the new order is Amendment "C" which makes two important changes. It deletes the provision of the previous order which refused assistance in replacement of equipment by improved equipment, and prohibited replacements "unless such existing installation is beyond repair". It has been found impossible, and in many cases undesirable, to require replacement with equipment exactly like the old. The procedure frequently held the producer to the use of antiquated equipment, and sometimes made it impossible for him to obtain any replacement equipment at all.

For your files we are reproducing this amendment below:

(c) Section 958.1 (Preference Rating Order No. P-22 Amended paragraph (b) (6) is hereby amended to read as follows:

"(b) (6) The terms 'Maintenance,' "Repair' and 'Operating Supplies' **do not** include Material:

(i) for the improvement of a Producer's property or equipment through the replacement of Material in the existing installation, unless such equipment is beyond repair;

(ii) for additions to, or expansion of, such property or equipment;

(iii) which is of a type not heretofore carried on the Producer's books under 'Maintenance,' 'Repairs,' 'Operating Supplies,' or the equivalent."

Amendment "A" embodies three changes, designed to assist important industries heretofore not specifically covered by the order. It has no particular importance to the telephone industry as it brings under the order several other industries including transportation of petroleum products. It means that pipelines, railroads, and truck fleets engaged in transporting products of the petroleum industry may apply A-10 rating on necessary repair and maintenance parts and operating supplies. Privately owned irrigation systems, toll bridges and toll canals are also included. The third change extends assistance of the order to those using tools or equipment to repair or maintain the property of other producers bringing assistance to independent contractors and others, such as machine and repair shops, and similar repair and maintenance operators.

Amendment "B" defines operating supplies as before, but rewords the definition to state that such supplies shall not include "any material which the producer acquires solely to distribute, store, or transport."

Amendment "D" changes the method by which exemption of various industries from the restrictions on deliveries, withdrawals and inventories, may be granted. The exemption of companies with total purchases or withdrawal of materials amounting to $2,500 per quarter is retained, however, Director Donald M. Nelson, Director of Priorities, inserted a paragraph in this amendment to the effect that from time to time the Director of Priorities may determine that certain producers or classes of producers are exempt, in whole or in part, from part of this amendment, not including the specific exemption mentioned earlier in this sentence to the amount of $2,500 per quarter on purchases or withdrawals.

# Week's Delay on Strike Threat

A strike called for midnight Nov. 14 which would affect the American Telephone and Telegraph communication system in 42 states and the nation's capital was postponed for at least a week.

John J. Moran, president of the Federation of Long Lines Telephone Workers, an independent union, said the walkout had been held up and the union's national council called into session here Nov. 21 at the request of Dr. John R. Steelman, director of the United States conciliation service.

Even though the A. T. & T. management had offered in previous conferences with the Long Lines Workers Federation wage increases of over $2,000,000 a year and a salary boost of 9%, the Federation's leadership had threatened a strike and had called upon the Long Lines workers to vote on a walkout. Despite the fact that the Federation membership had supported the strike move, it was felt the walkout, slated for Nov. 14, would never have been instituted and was actually only used as a bargaining weapon for the union to gain bigger increases of wages and the elimination of differentials of pay between the various regions of the country. It was understood that the Long Lines employees were loath to go out on a walkout because they realize the importance of telephone service as a vital element in national defense and civilian life. The leadership of the National Federation of Telephone Workers, the parent organization of the Long Lines Federation, too, was believed to be opposed to the Long Lines strike threat, not only because this weapon is regarded by the independent telephone union as the last resort in a bargaining dispute, but also due to the fact that public reaction is growing strongly against labor strikes.

The threat of the Long Lines strike, which was evidently intended by the union's leadership to place the controversy on wages before the National Defense Mediation Board, was sent to President Roosevelt in a telegram by John J. Moran, Long Lines Federation Chairman, and Henry Mayer, Federation Counsel. Mr. Mayer in another statement at the time of the telegram's transmittal declared that his union was trying to adhere to the President's labor policy of using all available mediation machinery before taking the fateful strike step. The prospect of a Long Lines telephone strike was grouped with other union walkout threats by the New York Times in an editorial which characterized such efforts as attempts to coerce the government itself by crippling national defense unless the government gives the labor organization what it wants.

THE A. T. & T. Long Lines management declared that it did not believe "employees of the calibre on which the public has been accustomed to depend for a vital service and who enjoy wages, working conditions and a degree of security which are truly enviable, would hastily interrupt Long Distance telephone service in the time of national emergency or that such an extreme step (strike) will be taken before every effort is exhausted to reach a friendly adjustment through the aid of Federal agencies provided for that purpose."

# argain"?

## y *today*, serve you well *tomorrow?*

When you buy central office equipment, it will pay you to think of the future as well as the present. Consider your purchase carefully in terms of ten, fifteen or twenty years hence—and be sure that equipment which looks like a "good buy" today, will be just as good a bargain under the changed conditions of tomorrow.

Strowger Automatic equipment is peculiarly well fitted to meet expansion and changing traffic conditions in years to come, due to its "small unit design." This is a fundamental and exclusive principle of the Strowger Automatic step-by-step system, and is highly important to the future operation of an exchange. It permits links to be added easily and quickly and over-all capacity to be increased by merely jacking in additional switch units.

This great flexibility is inherent in the basic design of Strowger Automatic step-by-step exchanges of every size. It permits their owners to cope with changing or expanding traffic conditions speedily and economically, without having to reinstall or rebuild their entire exchange. Even when complete new "shelves" and "frames" are required, these can be readily added by existing personnel and without interruption to service . . . Ask our representative to explain how Strowger "small unit design" differs from other systems, or write us direct for full information.

To add any Strowger switch to an existing "shelf," the switchman—

merely slips the switch into the frame, where the jack springs automatically make connections,—

fastens the bank supports, adjusts the wipers and snaps the dust cover into place. The switch is then ready for duty.

**AUTOMATIC ELECTRIC**

ORIGINATORS AND DEVELOPERS OF STROWGER STEP-BY-STEP MACHINE SWITCHING AUTOMATIC DIAL SYSTEMS

MAKERS OF TELEPHONE, SIGNALING AND COMMUNICATION APPARATUS
ELECTRICAL ENGINEERS, DESIGNERS AND CONSULTANTS

Distributors in U. S. and Possessions:
AMERICAN AUTOMATIC ELECTRIC SALES COMPANY, 1033 W. Van Buren St., Chicago, U.S.A.
Export Distributors: AUTOMATIC ELECTRIC SALES COMPANY, LIMITED

★ ★ ★ ★ ★ ★

NATIONAL DEFENSE

★ ★ ★ ★ ★ ★

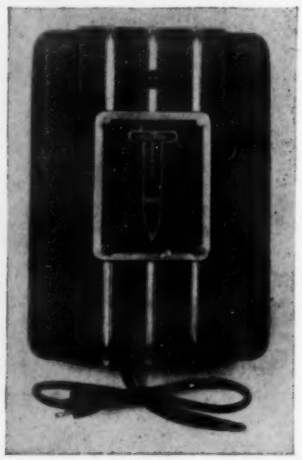
*has*

PRIORITY

While "all-out" National Defense co-operation is taxing our production facilities — We are proud we have been able to continue to make satisfactory deliveries to our government and to our customers in the telephone field.

TELERING

*Reliable ringing service is essential in providing satisfactory telephone service.*



Directly converts Commercial Alternating Current to Telephone Ringing Current—Current Consumption Negligible—Positively NO radio interference.

*Use TELERING and provide the MOST reliable service at the LEAST cost.*

*Order through your jobber or direct from*

TELKOR, Inc.
ELYRIA, OHIO

# Trial Comparative Cost Studies

(Continued from page 20)

land and the building.

If the Company occupies rented quarters, there will be no entry under First Cost but the annual rental for the Central Office will be entered on the summary of operating expenses.

2. **Central Office Equipment.**

Enter on the summary the book cost of the existing Central Office Equipment.

3. **Outside Cable and Wire Plant.**

Generally there will be no entry for this item.

4. **Subscribers' Station Apparatus.**

Enter on the summary the book cost of the subscribers' station apparatus.

Next, proceed to figure the annual charges on the items of First Cost and enter these costs on the summary sheet.

The same precedure should be followed in listing on the summary the operating expenses.

The sum of the annual charges and operating expenses will give the cost of operating the existing system which is the basis on which we should proceed to determine if a conversion is warranted from a cost standpoint.

The next step is to estimate the cost of the land and building needed to house the dial apparatus if such space is not available in the present building. Generally, land and building for a non-attended dial equipment up to 200 or 400 lines can be built including the land for about $2000 to $2500.

Leaving out for the moment the dial central office equipment.

Estimate the cost of any cable and pole line required to connect the dial central office to the existing plant.

Estimate the cost of the subscribers' station apparatus.

If a magneto system is to be converted to dial, it will be necessary to purchase new dial telephones, install them and to remove the old telephones.

If a common battery system is to be converted, it may be possible to add dials to the existing telephones.

Enter the estimated cost of the new telephones on the summary sheet.

Total the First Cost of the above items to obtain the First Cost less the dial central office equipment.

Next, proceed to figure the annual charges on the First Cost of the above items and enter the amounts on the summary sheet.

Then proceed to figure the operating cost.

In this case, assume there is no toll operating required, but that the dial system consists of an unattended office, and that the toll will be handled at a distant toll center. In this case there will be no operators' salaries and taxes.

Proceed to enter the other items of operating expenses, leaving out the item of central office maintenance and central office lighting and power.

Estimate the excess outside plant maintenance. This will generally be a small item of expense.

Estimate the excess subscribers' station maintenance.

Generally, this item is figured at not more than five cents per station per year and some companies do not include any charge for excess dial maintenance.

There will be no entry under the proposed dial operating costs for dry batteries.

Disregard items 8 and 9, amortization expenses.

Total the annual charges and operating expenses for the proposed dial systems.

The difference in the annual charges and operating expenses between the present manual and the proposed dial will be the approximate amount of money available to pay the annual charges on the dial central office equipment.

(TO BE CONCLUDED)

At the telephone conflab in Chicago last month (L. to R.) Red Parsons, C. C. Deering and "Hube" Hubenthal.

C. P. Stocker and Fred Heavens of Lorain Products are "regulars" at all National conventions.

# Quantitative Design for Central Office Equipment

(Continued from page 25)

shifted around on the building plans until the preliminary location of all the equipment has been tentatively but definitely fixed. Obviously one of the primary items to be subjected to this method of treatment is the Main Distributing Frame the dimensions of which can be adjusted to some extent by changes in the height of the protector verticals and the type of frame and arrangement of terminals. In Fig. 1 is shown, for example, the outline of a template for a Cook, Type "B", 400 pair, 100 pairs high M.D.F. on a scale of 1½ inches to the foot . When used with a floor plan in working out the relative locations of the several elements of the equipment all templates should, of course, be made on the same scale as the floor plan. It will be found that the definite arrangements of the equipment on a scale floor plan in this way is very necessary because of the several adjustments as to floor area occupied that are possible in almost every element of the equipment. This is illustrated very nicely in the case of the Main Distributing Frame outlined in Fig. 1. If this Main Distributing Frame should be designed to permit the use of protectors 150 pairs high instead of 100 high only three verticals would be necessary and the frame instead of being 2'-6" long would only be 1'-10½" long, a very considerable saving in the floor area required for the Main Distributing Frame.

(TO BE CONTINUED)

## George B. Stuart

George B. Stuart

Mr. George B. Stuart, of Dallas, Texas, son of Mr. and Mrs. A. C. Stuart of Texarkana, Texas, passed away at a local hospital in Texarkana October 1st, 1941.

Mr. Stuart for the past twelve years had been associated with the Southwestern Bell Telephone Company in Dallas, as local manager. He was an officer in the World's war and was a member of the famed lost battalion regiment. At the time of his passing he was also a director in the Two States Telephone Company, a member of the Exchange Club of Dallas and former President of the Round Table Club of Dallas.

Mr. Stuart had been in ill health for some few years, and at the time of passing was 45 years old.

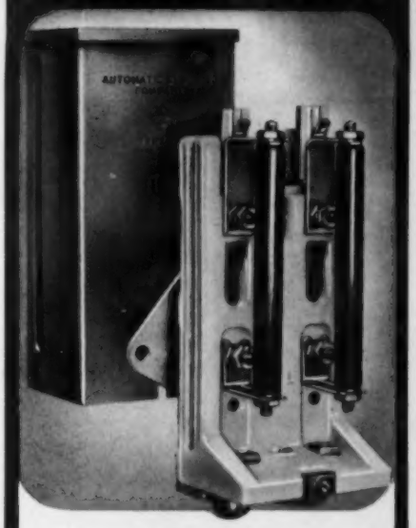
He is survived by his widow, Mrs. Cornelia Stuart, Dallas, Texas, his parents, Mr. and Mrs. A. C. Stuart, one brother, James E. Stuart, all of Texarkana, Texas, and one sister, Mrs. George B. Butler, of Austin, Texas. His father is President of the Two-States Telephone Company, The Greenville, Palestine and the United Telephone Companies, and his brother is Vice-president of the Two States Telephone Company.

## J. J. Milligan

J. J. Milligan, veteran manager of the Chicago office of the A. B. Chance Co., Centralia, Mo., died during the morning of November 2 following a major operation performed the day before. Mr. Milligan had not been in good health for sometime although he was able to attend the October convention of the National Association.

Mr. Milligan was one of the best known sales representatives of the Chance organization having been with them for a quarter of a century. He is survived by his widow and a sister.

SANDS
SUBSTATION PROTECTOR



TYPE 15
for Indoors or Outdoors

Here is a weather-proof design which provides better protection at lower cost on any type of line. It saves installation cost because its new "Four Point" bracket makes mounting easier. It pares maintenance expense, thanks to the Type 2105 discharge block, which resets itself after operation.

Next time, order Type 15; it assures you complete protection.

"UL" stamped on the case means listed by Underwriters' Laboratories, Inc., as meeting their requirements for such use.

Distributors in U. S. and Possessions:
AMERICAN AUTOMATIC ELECTRIC SALES COMPANY
1033 West Van Buren Street, Chicago, U.S.A.

AUTOMATIC ELECTRIC
TELEPHONE, SIGNALING, AND COMMUNICATION APPARATUS

Conducted by B. C. BURDEN, Technical Editor

# Line AND Desk

## *Open Wire*

**Q. How can the resistance of a single wire be determined when there are several wires in the section in which the measurement is desired?**

A. Single wire resistance can be determined by the use of three wires and the triangulation formula, (See Fig. 1) Short all three wires, one on which should be the wire whose resistance is desired. Call the wires a, b, and c. Measure the loop resistance of (a+b), (b+c), and (a+c). The resistance of each of the wires can then be found by the following formula:

$$a = \frac{(a+b)+(a+c)+(b+c)}{2} - (b+c)$$

$$b = (a+b) - a$$

$$c = (b+c) - a$$

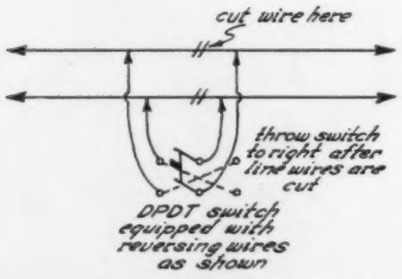



Fig. 1—Switch for Use in Transposing Open Wire Line without Disturbing Service.

**Q. Is there any method whereby transpositions can be cut into phantom groups without interfering with service over the group?**

A. Yes, this can be accomplished by the use of a special switch box used at the point where the transposition is cut in and a relay switching unit in the nearest office. The 8 leads from the box are connected to the four wires extending in each direction and with slack blocks in place the four wires are cut. The keys are then thrown from their normal position to the type phantom transposition to be cut in. This also throws a ground on the phantom which operates the relay and transfers drops at the C. O. The wires may then be spliced according to the type transposition being cut without interference to the working circuit. Transpositions in non-phantomed circuits, or transpositions in side circuits can be cut in using a simple two pole reversing key arranged as shown in Fig. 1.

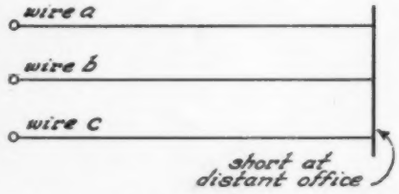



Fig. 1—Triangulation Method of Measuring Single Wire Resistance.

**Q. How can the frequency response of a 19 ga. cable which is several miles long be improved so that program material can be passed over it?**

A. Where the loss of a cable is more than one or two db an **equalizer** will improve the response. The equalizer consists of a resistance inductance, and capacitance connected as shown in Fig. 1. The values shown are for a typical equalizer. The equalizer can be placed at either end of the cable but preferably at the sending end.

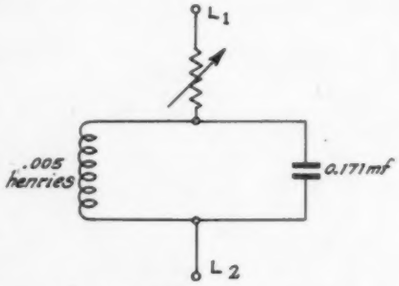



Fig. 1—Cable Equalizer Circuit.

## *Cable*

**Q. Under what circumstances should cable grade clamps be used?**

A. Grade clamps should be used where the charge in grade is greater than 40 feet per hundred feet. For moderate grades the clamps should be placed at the beginning of the grade and on every fourth pole on the grade. For heavy cables grade clamps will be required for grades as low as 1%.

## *Poles*

**Q. Please explain the construction method used where it is impossible to use guys on a curve in an open wire line.**

A. A substantial corner can be built without guys by the use of A frames and X braces arranged as shown in Figure 1.

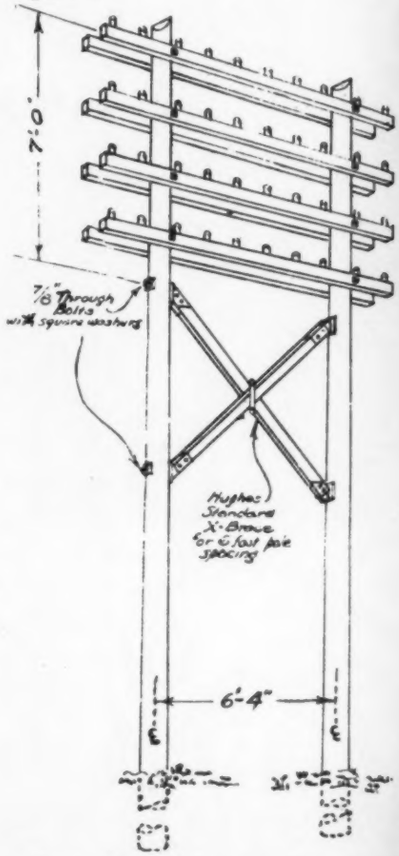



Fig. 1—Use of X Braces on Corners.

Telephone companies buying supplies from Stromberg-Carlson receive the benefits of 66 supply depots located in 25 different states. From New England to California—from Washington to Florida, you will find these depots.

This is of extreme importance when shipments must be speedy. Of equal importance is the high quality of the construction materials and supplies sold by Stromberg-Carlson. Every item must meet exacting tests as to construction, performance, and durability before being added to the line.

*If unvarying high quality, maximum length of service, and dependably fast shipments are what you're looking for, place your next supply order with STROMBERG-CARLSON.*

STROMBERG-CARLSON TELEPHONE MANUFACTURING COMPANY—Factory and General Offices: 100 Carlson Road, Rochester, N. Y., U.S.A. Branch Offices: Chicago Kansas City San Francisco Toronto

# Stromberg-Carlson

MAKERS OF VOICE TRANSMISSION AND VOICE RECEPTION APPARATUS FOR FORTY-SIX YEARS

Conducted by
R. A. Clark, Jr.

# Cross-talk Data

**This article, third of a series presents tables for computing the cross-talk between phantom circuits and between phantom and physical circuits.**

There is some advantage in the use of phantom circuits for carrier operations in certain cases especially where there are a large number of bridged way station telephones on one side of the phantom such as a train dispatching circuit. It is therefore of interest to know what the comparative cross-talk values are between pairs and phantoms and between phantoms. Table 1 shows the cross-talk between pairs and phantoms; Table 2 shows the cross-talk between phantoms. The cross-talk figures are in DB per mile of untransposed wire at 1,000 cycles the same as the table in the previous months article.

The cost of retransposing a telephone line for carrier operation may often be kept down to a reasonably low figure by proper choice of circuits and by the judicious use of special transpositions installed on the wires over which the carrier circuits route. In subsequent articles we will discuss the method of laying out special transpositions for carrier operation using the tables shown in this and the preceeding articles.

| | 1-4 | 5-16 | 7-10 | 11-14 | 15-26 | 17-20 | 21-24 | 25-36 | 27-30 | 31-34 | 37-40 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1- 2 | 53.5 | 76.8 | 80.4 | 61.8 | 74.8 | 82.7 | 70.5 | 79.5 | 88.7 | 76.5 | 100.0 |
| 3- 4 | 54.7 | 57.3 | 72.9 | 63.2 | 67.4 | 77.6 | 72.8 | 79.1 | 91.3 | 79.3 | 100.0 |
| 5- 6 | 54.7 | | 54.7 | 70.3 | | 70.3 | 84.0 | | 84.0 | 82.5 | 82.5 |
| 7- 8 | 72.9 | 57.3 | 54.7 | 77.6 | 67.4 | 63.2 | 91.3 | 79.1 | 72.8 | 100.0 | 79.3 |
| 9-10 | 80.4 | 76.8 | 53.5 | 82.7 | 74.8 | 61.8 | 88.7 | 79.5 | 70.5 | 100.0 | 76.5 |
| 11-12 | 61.7 | 75.8 | 83.0 | 53.4 | 77.0 | 80.7 | 61.8 | 74.3 | 82.6 | 70.2 | 88.9 |
| 13-14 | 63.2 | 57.2 | 77.5 | 54.5 | 57.2 | 73.3 | 63.5 | 67.7 | 77.6 | 72.9 | 94.5 |
| 15-16 | 70.5 | | 70.5 | 54.7 | | 54.7 | 70.7 | | 70.7 | 84.2 | 84.2 |
| 17-18 | 77.5 | 57.2 | 63.2 | 73.3 | 57.2 | 54.5 | 77.6 | 67.7 | 63.5 | 94.5 | 72.9 |
| 19-20 | 83.0 | 75.8 | 61.7 | 80.7 | 77.0 | 53.4 | 82.6 | 74.3 | 61.8 | 88.9 | 70.2 |
| 21-22 | 70.3 | 74.2 | 89.0 | 61.8 | 76.8 | 82.7 | 53.9 | 76.0 | 80.6 | 61.6 | 81.4 |
| 23-24 | 73.0 | 67.7 | 91.5 | 63.5 | 57.3 | 78.0 | 54.8 | 57.2 | 73.1 | 63.2 | 77.5 |
| 25-26 | 84.1 | | 84.1 | 71.0 | | 71.0 | 54.6 | | 54.6 | 70.2 | 70.2 |
| 27-28 | 91.5 | 67.7 | 73.0 | 78.0 | 57.3 | 63.5 | 73.1 | 57.2 | 54.8 | 77.5 | 63.2 |
| 29-30 | 89.0 | 74.2 | 70.3 | 82.7 | 76.8 | 61.8 | 80.6 | 76.0 | 53.9 | 81.4 | 61.6 |
| 31-32 | 76.5 | 79.5 | 98.0 | 70.5 | 74.8 | 88.5 | 61.6 | 76.9 | 82.5 | 53.6 | 80.5 |
| 33-34 | 79.4 | 79.5 | 99.0 | 73.0 | 67.2 | 92.8 | 63.2 | 57.1 | 77.6 | 54.4 | 73.0 |
| 35-36 | 82.2 | | 82.2 | 84.0 | | 84.0 | 70.6 | | 70.6 | 54.7 | 54.7 |
| 37-38 | 99.0 | 79.5 | 79.4 | 92.8 | 67.2 | 73.0 | 77.6 | 57.1 | 63.2 | 73.0 | 54.4 |
| 39-40 | 98.0 | 79.5 | 76.5 | 88.5 | 74.8 | 70.5 | 82.5 | 76.9 | 61.6 | 80.5 | 53.6 |

Table 1—Crosstalk between Phantoms and Pairs in D.B. at 1000 Cycles per Mile

| | 1-4 | 5-16 | 7-10 | 11-14 | 15-26 | 17-20 | 21-24 | 25-36 | 27-30 | 31-34 | 37-40 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1- 4 | | 55.7 | 67.7 | 51.5 | 61.6 | 71.7 | 62.5 | 70.4 | 81.2 | 69.0 | 106.0 |
| 5-16 | 55.7 | | 55.7 | 55.9 | | 55.9 | 61.6 | 55.4 | 61.6 | 70.2 | 70.2 |
| 7-10 | 67.7 | 55.7 | | 71.7 | | 51.5 | 81.2 | 70.4 | 62.5 | 106.0 | 69.0 |
| 11-14 | 51.5 | 55.9 | 71.7 | | 55.7 | 68.2 | 51.8 | 61.7 | 71.7 | 62.4 | 81.7 |
| 15-26 | 61.6 | | 61.6 | 55.7 | | 55.7 | 55.8 | | 55.8 | 61.5 | 61.5 |
| 17-20 | 71.7 | 55.9 | 51.5 | 68.2 | 55.7 | | 71.7 | 61.7 | 51.8 | 81.7 | 62.4 |
| 21-24 | 62.5 | 61.6 | 81.2 | 51.8 | 55.8 | 71.7 | | 55.7 | 68.2 | 51.5 | 71.4 |
| 25-36 | 70.4 | 55.4 | 70.4 | 61.7 | | 61.7 | 55.7 | | 55.7 | 55.6 | 55.6 |
| 27-30 | 81.2 | 61.6 | 62.5 | 71.7 | 55.8 | 51.8 | 68.2 | 55.7 | | 71.4 | 51.5 |
| 31-34 | 69.0 | 70.2 | 106.0 | 62.4 | 61.5 | 81.7 | 51.5 | 55.6 | 71.4 | | 67.8 |
| 37-40 | 106.0 | 70.2 | 69.0 | 81.7 | 61.5 | 62.4 | 71.4 | 55.6 | 51.5 | 67.8 | |

Table 2—Crosstalk between Phantoms in D.B. at 1000 Cycles per Mile

## General Van Deusen To Command Fort Monmouth

Brigadier General George L. Van Deusen was appointed by the War Department as commandant of the Signal Corps School at Fort Monmouth, N. J., Oct. 30. He succeeds Major General Dawson Olmstead, recently appointed Chief Signal Officer of the Army. General Van Deusen has been in command of the Signal Corps Replacement Training Center, also at Fort Monmouth, since last January.

## October Phone Station Gains Set New Records

American Telephone & Telegraph Company reported recently that its principal Bell System telephone subsidiaries added more telephones to their service during October than in any previous October on record, with a gain of 120,300 stations, lifting total service to a record of about 18,609,400 units.

In October last year 101,400 units were added, while in September this year a gain of 142,500 units occurred. The previous October high was an increase of 107,100 stations in 1936.

***The outpost's*** **job takes nerve. His telephone is a terminal of the nerve system of the army behind him. What his commander does depends largely on information he telephones.**

# "Enemy tanks advancing on bridgehead"

The telephone is vital to you in business and home, but to the army in the field it may mean the difference between defeat and victory.

It is the reliable messenger, delivering in a flash information that enables the brains of infantry, artillery, tank corps and air force to direct their operations with sure control.

To make telephones that perform under these difficult field conditions, Western Electric began to qualify sixty years ago. Then this Company became the chief source of supply for the entire Bell Telephone System.

Ever since, it has led the world in the production of dependable telephone apparatus. It has built up a coordinated group of plants and a nationwide system of delivering the goods where and when needed.

Now when your Bell Telephone Company and the Army and the Navy are calling for more telephones and switchboards and wire and cable, Western Electric is responding with expanded facilities and man power to meet these defense needs.

***To make sure*** **the field telephone won't let the soldier down, Western Electric gives it many tests—including the talk-test shown.**

# *Western Electric*

***. . . is back of your Bell Telephone service***

LOCATE LINE TROUBLES *QUICKLY*

*with a*

**WEST TEST SET**

SHORTS, grounds, crosses, opens, arrester faults, high resistance joints — all are easier to track down with the West Test Set.

It is ruggedly built to withstand the abuse of outdoor use. Simple and reliable to operate, and perfect results are secured even in the hands of an inexperienced operator. By its use the direction and location of any line fault can be positively determined without opening any lines or interfering with busy circuits.

The West Test Set makes your lineman's work more productive because he spends less time "hunting". Price with metal case $40.00; with leather case, $42.50.

f.o.b. Chicago

Distributors in U.S. and Possessions:
AMERICAN AUTOMATIC ELECTRIC SALES COMPANY
1033 W. Van Buren Street, Chicago, Ill.

AUTOMATIC ELECTRIC

TELEPHONE, SIGNALING, AND COMMUNICATION APPARATUS


# Wire Chief's Training Course

(Continued from page 23)

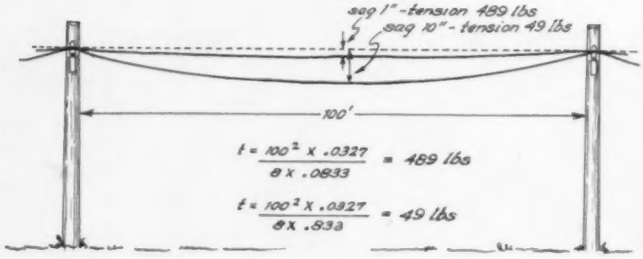

sag 1" - tension 489 lbs
sag 10" - tension 49 lbs
100'
$t = \frac{100^2 \times .0327}{8 \times .0833} = 489$ lbs
$t = \frac{100^2 \times .0327}{8 \times .833} = 49$ lbs

Fig. 12—Effect of Inadequate Sag on Tension

Assume that we have a 100 foot span of .104 (#12-NBS) copper wire and that we place it with a sag of only one inch as compared to ten inches. What is the tension in the wire? As the computations of Fig. 12 show, the tension would be 490 lbs. for the one inch sag but only 49 lbs. for the ten inch sag.

## STRINGING SAGS FOR NO. 85 STEEL WIRE (No. 12 B. W. G.),

**TABLE 1 — Heavy Loading Districts — Long Spans from 125 to 225 Feet**

| Span Length (Feet) | Temperatures in Degrees Fahrenheit | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 100° | 90° | 80° | 70° | 60° | 50° | 40° | 30° | 20° | 10° | 0° | -10° |
| | —Sags in Inches— | | | | | | | | | | | |
| 125 | 13.0 | 12.0 | 11.0 | 10.0 | 9.5 | 8.5 | 7.5 | 7.0 | 6.5 | 6.0 | 5.5 | 5.0 |
| 130 | 14.0 | 13.0 | 12.0 | 11.0 | 10.0 | 9.0 | 8.0 | 7.5 | 7.0 | 6.5 | 6.0 | 5.5 |
| 140 | 16.0 | 15.0 | 14.0 | 12.5 | 11.5 | 10.5 | 9.5 | 9.0 | 8.0 | 7.5 | 7.0 | 6.5 |
| 150 | 18.5 | 17.0 | 16.0 | 14.5 | 13.0 | 12.0 | 11.0 | 10.0 | 9.0 | 8.5 | 7.5 | 7.0 |
| 160 | 21.0 | 19.5 | 18.0 | 16.0 | 15.0 | 14.0 | 12.5 | 11.5 | 10.5 | 9.5 | 9.0 | 8.0 |
| 170 | 23.5 | 22.0 | 20.5 | 18.5 | 17.0 | 15.5 | 14.0 | 13.0 | 12.0 | 11.0 | 10.0 | 9.5 |
| 180 | 26.5 | 24.5 | 23.0 | 20.5 | 19.0 | 17.5 | 15.5 | 14.5 | 13.0 | 12.0 | 11.0 | 10.5 |
| 190 | 29.5 | 27.0 | 25.5 | 23.0 | 21.0 | 19.5 | 17.0 | 16.0 | 14.5 | 13.5 | 12.0 | 11.5 |
| 200 | 33.0 | 30.0 | 28.5 | 25.5 | 23.5 | 21.5 | 19.0 | 18.0 | 16.0 | 15.0 | 13.5 | 13.0 |
| 210 | 36.0 | 33.0 | 31.5 | 28.0 | 26.0 | 23.5 | 21.0 | 19.5 | 17.5 | 16.5 | 15.0 | 14.5 |
| 220 | 39.5 | 36.5 | 34.0 | 30.5 | 28.5 | 26.0 | 23.5 | 21.5 | 19.5 | 18.0 | 16.5 | 15.5 |
| 225 | 41.5 | 38.0 | 35.5 | 32.5 | 30.0 | 27.0 | 25.0 | 23.0 | 21.0 | 19.0 | 17.5 | 16.5 |

These sags are such that the unloaded tensions at minus 10 degrees fahrenheit equal approximately one-fifth of the rated breaking strength of No. 85 wire, for all span lengths shown above.

**TABLE 2 — Medium Loading Districts — Long Spans from 200 to 325 Feet**

| Span Length (Feet) | Temperatures in Degrees Fahrenheit | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 100° | 90° | 80° | 70° | 60° | 50° | 40° | 30° | 20° | 10° | 0° | -10° |
| | —Sags in Inches— | | | | | | | | | | | |
| 200 | 25.0 | 23.5 | 22.0 | 20.5 | 19.0 | 17.5 | 16.5 | 15.0 | 14.0 | 13.0 | 12.0 | 11.5 |
| 210 | 27.5 | 26.0 | 24.0 | 22.5 | 21.0 | 19.5 | 18.0 | 16.5 | 15.5 | 14.5 | 13.5 | 13.0 |
| 220 | 30.0 | 28.5 | 26.5 | 25.0 | 23.0 | 21.5 | 20.0 | 18.5 | 17.0 | 16.0 | 15.0 | 14.0 |
| 230 | 33.0 | 31.0 | 29.0 | 27.0 | 25.0 | 23.5 | 21.5 | 20.0 | 18.5 | 17.5 | 16.0 | 15.0 |
| 240 | 36.0 | 33.5 | 31.5 | 29.5 | 27.0 | 25.5 | 23.5 | 21.5 | 20.5 | 19.0 | 17.5 | 16.5 |
| 250 | 39.0 | 36.5 | 34.0 | 32.0 | 29.5 | 27.5 | 25.5 | 23.5 | 22.0 | 20.5 | 19.0 | 18.0 |
| 260 | 42.0 | 39.5 | 37.0 | 34.5 | 32.0 | 29.5 | 27.5 | 25.5 | 24.0 | 22.0 | 20.5 | 19.5 |
| 270 | 45.5 | 42.5 | 39.5 | 37.5 | 34.5 | 32.0 | 30.0 | 27.5 | 25.5 | 24.0 | 22.0 | 21.0 |
| 280 | 49.0 | 45.5 | 42.5 | 40.0 | 37.0 | 34.5 | 32.0 | 29.5 | 27.5 | 25.5 | 24.0 | 22.5 |
| 290 | 52.5 | 49.0 | 46.0 | 43.0 | 39.5 | 37.0 | 34.5 | 32.0 | 29.5 | 27.5 | 25.5 | 24.0 |
| 300 | 56.0 | 52.5 | 49.0 | 46.0 | 42.5 | 39.5 | 36.5 | 33.5 | 32.0 | 29.5 | 27.5 | 26.0 |
| 310 | 60.0 | 56.0 | 52.5 | 49.5 | 45.5 | 42.5 | 39.0 | 36.0 | 34.0 | 31.5 | 29.0 | 27.5 |
| 320 | 64.0 | 60.0 | 56.0 | 52.5 | 49.5 | 45.0 | 42.0 | 38.5 | 36.0 | 33.5 | 31.0 | 29.5 |
| 325 | 66.0 | 62.0 | 58.0 | 54.5 | 51.5 | 47.5 | 44.0 | 40.5 | 37.0 | 34.5 | 32.0 | 30.5 |

These sags are such that the unloaded tensions at minus 10 degrees fahrenheit equal approximately one-fifth of the rated breaking strength of No. 85 wire, for all span lengths shown above.

**TABLE 3 — Light Loading Districts — Long Spans from 275 to 375 Feet**

| Span Length (Feet) | Temperatures in Degrees Fahrenheit | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 100° | 90° | 80° | 70° | 60° | 50° | 40° | 30° | 20° | 10° | 0° | -10° |
| | —Sags in Inches— | | | | | | | | | | | |
| 275 | 40.0 | 37.5 | 35.0 | 32.0 | 30.5 | 28.0 | 26.0 | 24.0 | 22.5 | 21.0 | 19.5 | 18.5 |
| 280 | 41.5 | 39.0 | 36.5 | 33.5 | 31.5 | 29.0 | 27.0 | 25.0 | 23.5 | 22.0 | 20.5 | 19.0 |
| 290 | 44.5 | 41.5 | 39.0 | 36.5 | 34.0 | 31.5 | 29.0 | 27.0 | 25.0 | 23.5 | 22.0 | 20.5 |
| 300 | 47.5 | 44.5 | 41.5 | 38.5 | 36.0 | 33.5 | 31.0 | 29.0 | 27.0 | 25.0 | 23.5 | 22.0 |
| 310 | 51.0 | 47.5 | 44.5 | 41.5 | 38.5 | 36.0 | 33.0 | 31.0 | 28.5 | 26.5 | 25.0 | 23.5 |
| 320 | 54.0 | 50.5 | 47.5 | 44.5 | 41.5 | 38.5 | 35.5 | 33.0 | 30.5 | 28.5 | 26.5 | 25.0 |
| 330 | 57.5 | 54.0 | 50.5 | 47.0 | 44.0 | 41.0 | 37.5 | 35.0 | 32.5 | 30.5 | 28.5 | 26.5 |
| 340 | 61.0 | 57.5 | 53.5 | 50.0 | 46.5 | 43.5 | 40.0 | 37.0 | 34.5 | 32.0 | 30.0 | 28.0 |
| 350 | 64.5 | 60.5 | 56.5 | 53.0 | 49.0 | 46.0 | 42.5 | 39.5 | 36.5 | 34.0 | 32.0 | 30.0 |
| 360 | 68.5 | 64.0 | 60.0 | 56.0 | 52.0 | 48.5 | 45.0 | 42.0 | 39.0 | 36.5 | 34.0 | 32.0 |
| 370 | 72.0 | 67.5 | 63.5 | 59.0 | 55.0 | 51.0 | 47.5 | 44.5 | 41.0 | 38.5 | 36.0 | 33.5 |
| 375 | 74.0 | 69.5 | 65.0 | 60.5 | 56.5 | 52.5 | 48.5 | 45.5 | 42.0 | 39.0 | 36.5 | 34.0 |

These sags are such that the unloaded tensions at minus 10 degrees fahrenheit equal approximately one-fourth of the rated breaking strength of No. 85 wire, for all span lengths shown above.

TAYLOR-COLQUITT CO.
CREOSOTED PINE POLES

**This Final Check Before They're Yours**

To make absolutely certain that the poles have received full creosote penetration, this man takes increment borings of each charge as it is withdrawn from the treating cylinder.

This is the last of many inspections made by Taylor-Colquitt to guarantee you of perfectly impregnated, sound, long-lived poles. And long life means lower cost per year of service.

DISTRIBUTED BY
AMERICAN
AUTOMATIC ELECTRIC
SALES COMPANY
1033 WEST VAN BUREN STREET · CHICAGO, ILLINOIS
BRANCH WAREHOUSES AT DALLAS, KANSAS CITY, LOS ANGELES, RICHMOND (VA.) AND SAN FRANCISCO


# Telephone Engineer

## HANDBOOK TABLES

By B. C. Burden

File — General Data
Date—Nov. 15, 1941

### *Subject*—WIRE CAPACITY OF CONDUIT

### *General:*

The wire capacity of electrical conduit is fixed by the National Electric Code. The Code requirements are based on the number of wires that can be placed in a conduit without danger of mechanical injury to the wires. The minimum size conduit for various numbers and types of wire is shown below:

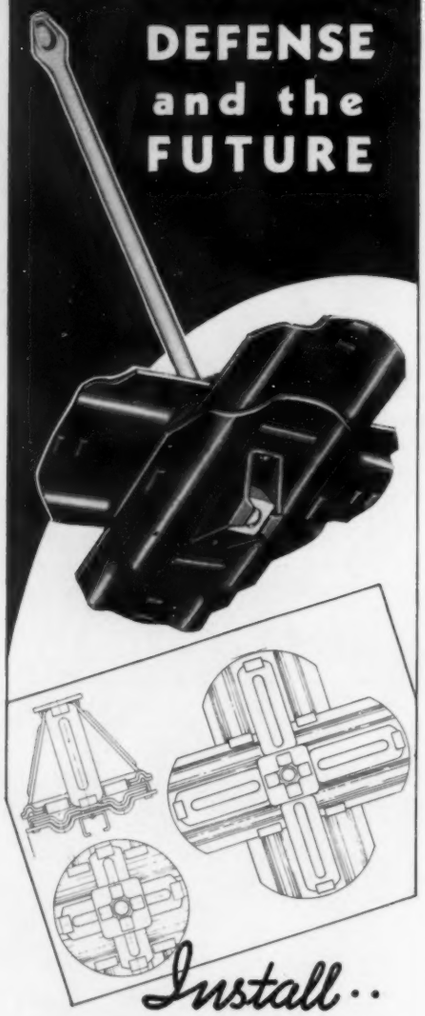
**RUBBER COVERED WIRES—600 VOLTS**

| Size of Wire (B & S) | Number of Wires in One Conduit: 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| | Minimum Size of Conduit in Inches | | | | | | | | |
| 14 | ½ | ½ | ½ | ½ | ¾ | ¾ | ¾ | 1 | 1 |
| 12 | ½ | ½ | ½ | ¾ | ¾ | 1 | 1 | 1 | 1¼ |
| 10 | ½ | ¾ | ¾ | ¾ | 1 | 1 | 1¼ | 1¼ | 1¼ |
| 8 | ½ | ¾ | 1 | 1 | 1 | 1¼ | 1¼ | 1¼ | 1½ |
| 6 | ½ | 1 | 1¼ | 1¼ | 1½ | 1½ | 2 | 2 | 2 |
| 4 | ¾ | 1¼ | 1¼ | 1½ | 2 | 2 | 2 | 2 | 2½ |
| 2 | ¾ | 1¼ | 1½ | 1½ | 2 | 2 | 2½ | 2½ | 2½ |
| 1 | ¾ | 1½ | 1½ | 2 | 2 | 2½ | 2½ | 3 | 3 |
| 0 | 1 | 1½ | 2 | 2 | 2½ | 2½ | 3 | 3 | 3 |
| 00 | 1 | 2 | 2 | 2½ | 2½ | 3 | 3 | 3 | 3½ |
| 000 | 1 | 2 | 2 | 2½ | 3 | 3 | 3 | 3½ | 3½ |
| 0000 | 1¼ | 2 | 2½ | 2½ | 3 | 3 | 3½ | 3½ | 4 |

**LEAD COVERED WIRES—600 VOLTS**

| Size of Wire (B & S) | Single Conductor: 1 Cable in One Conduit | 2 Cables in One Conduit | 3 Cables in One Conduit | 4 Cables in One Conduit | 2-Conductor: 1 Cable in One Conduit | 2 Cables in One Conduit | 3 Cables in One Conduit | 4 Cables in One Conduit | 3-Conductor: 1 Cable in One Conduit | 2 Cables in One Conduit | 3 Cables in One Conduit | 4 Cables in One Conduit |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 14 | ½ | ¾ | ¾ | ¾ | ½ | 1 | 1 | 1¼ | ¾ | 1¼ | 1½ | 1½ |
| 12 | ½ | ¾ | ¾ | 1 | ¾ | 1 | 1¼ | 1¼ | 1 | 1¼ | 1½ | 2 |
| 10 | ½ | ¾ | 1 | 1 | ¾ | 1¼ | 1¼ | 1½ | 1 | 1½ | 2 | 2 |
| 8 | ½ | 1 | 1 | 1¼ | 1 | 1¼ | 1½ | 2 | 1 | 2 | 2 | 2½ |
| 6 | ¾ | 1¼ | 1¼ | 1½ | 1¼ | 1½ | 2 | 2½ | 1¼ | 2½ | 3 | 3 |
| 4 | ¾ | 1¼ | 1½ | 1½ | 1¼ | 2 | 2½ | 2½ | 1½ | 3 | 3 | 3½ |
| 2 | 1 | 1¼ | 1½ | 2 | 1¼ | 2 | 2½ | 3 | 1½ | 3 | 3½ | 4 |
| 1 | 1 | 1½ | 2 | 2 | 1½ | 2½ | 3 | 3½ | 2 | 3½ | 4 | 4½ |
| 0 | 1 | 2 | 2 | 2½ | 2 | 2½ | 3 | 3½ | 2 | 4 | 4½ | 5 |
| 00 | 1 | 2 | 2 | 2½ | 2 | 3 | 3½ | 4 | 2½ | 4 | 4½ | 5 |
| 000 | 1¼ | 2 | 2½ | 2½ | 2 | 3 | 3½ | 4 | 2½ | 4½ | 4½ | 6 |
| 0000 | 1¼ | 2½ | 2½ | 3 | 2½ | 3 | 3½ | 4½ | 3 | 5 | 6 | 6 |

To build LINE SECURITY for DEFENSE and the FUTURE





*Install* . .

CHANCE STEEL EXPANDING ANCHORS . . .

- They are available in sizes from 6 to 12 inches diameter for 2 or 4 way expansion, and have a rated holding power ranging from 3000 to 42,000 pounds.
- They expand to more than twice their size giving extra area in solid earth.
- They are adaptable to clay, loam, sand, or hardpan.
- The all steel construction withstands severe punishment without danger of breaking or coming apart.
- Blades are so constructed that they won't slip out of place during installation.
- The destructible nut retainer prevents anchors from riding up the rod during installation, and permits rod salvage or abandonment.
- Rigid connections, grooved blades and base plates make it impossible for roots, rock, etc., to throw blades out of alignment.
- The blades expand in opposite directions equalizing pull strain and preventing side twisting or shifting.

For dependable holding power, line security, and quick delivery, always specify and insist on Chance Steel Expanding Anchors.

A·B·CHANCE CO. CENTRALIA MISSOURI


## STRINGING SAGS FOR NO. 135 STEEL WIRE (No. 12 B. W. G.)

### TABLE 4 — Long Spans in Heavy Loading Districts

| Span Length (Feet) | Temperatures in Degrees Fahrenheit | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 100° | 90° | 80° | 70° | 60° | 50° | 40° | 30° | 20° | 10° | 0° | -10° |
| | —Sags in Inches— | | | | | | | | | | | |
| 200 | 15.0 | 14.0 | 13.0 | 12.5 | 11.5 | 11.0 | 10.0 | 9.5 | 9.5 | 9.0 | 8.0 | 7.5 |
| 210 | 16.5 | 15.5 | 14.5 | 13.5 | 12.5 | 12.0 | 11.0 | 10.5 | 10.0 | 9.5 | 9.0 | 8.5 |
| 220 | 18.0 | 17.0 | 16.0 | 15.0 | 14.0 | 13.0 | 12.0 | 11.5 | 11.0 | 10.5 | 10.0 | 9.5 |
| 230 | 19.5 | 18.5 | 17.5 | 16.0 | 15.0 | 14.0 | 13.5 | 13.0 | 12.0 | 11.5 | 10.5 | 10.0 |
| 240 | 21.5 | 20.0 | 19.0 | 17.5 | 16.5 | 15.5 | 14.5 | 14.0 | 13.0 | 12.5 | 11.5 | 11.0 |
| 250 | 23.0 | 21.5 | 20.5 | 19.0 | 18.0 | 16.5 | 15.5 | 15.0 | 14.0 | 13.5 | 12.5 | 12.0 |
| 260 | 25.0 | 23.5 | 22.0 | 21.0 | 19.5 | 18.0 | 17.0 | 16.0 | 15.0 | 14.5 | 13.5 | 13.0 |
| 270 | 27.0 | 25.5 | 24.0 | 22.5 | 21.0 | 19.5 | 18.5 | 17.5 | 16.5 | 15.5 | 15.0 | 14.0 |
| 280 | 29.0 | 27.5 | 25.5 | 24.0 | 22.5 | 21.0 | 19.5 | 18.5 | 17.5 | 16.5 | 16.0 | 15.0 |
| 290 | 31.5 | 29.5 | 27.5 | 26.0 | 24.0 | 22.5 | 21.0 | 20.0 | 19.0 | 18.0 | 17.0 | 16.0 |
| 300 | 33.5 | 31.5 | 29.5 | 28.0 | 26.0 | 24.0 | 22.5 | 21.5 | 20.5 | 19.5 | 18.5 | 17.5 |
| 310 | 35.5 | 33.5 | 31.5 | 29.5 | 27.5 | 26.0 | 24.0 | 23.0 | 21.5 | 20.5 | 19.5 | 18.5 |
| 320 | 38.0 | 35.5 | 33.5 | 31.5 | 29.5 | 27.5 | 26.0 | 24.5 | 23.0 | 22.0 | 20.5 | 19.5 |
| 330 | 40.5 | 38.0 | 35.5 | 33.0 | 31.0 | 28.5 | 27.5 | 26.0 | 24.5 | 23.5 | 22.0 | 21.0 |
| 340 | 43.0 | 40.5 | 37.5 | 35.0 | 33.0 | 31.0 | 29.0 | 27.5 | 26.0 | 24.5 | 23.5 | 22.0 |
| 350 | 45.5 | 43.0 | 40.0 | 37.5 | 35.0 | 33.0 | 31.0 | 29.0 | 27.5 | 26.0 | 25.0 | 23.5 |

These sags are such that the unloaded tensions at minus 10 degrees fahrenheit equal approximately one-fifth of the rated breaking strength of No. 135 Wire, for all span lengths shown above.

### TABLE 5 — Long Spans in Medium Loading Districts

| Span Length (Feet) | Temperatures in Degrees Fahrenheit | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 110° | 100° | 90° | 80° | 70° | 60° | 50° | 40° | 30° | 20° | 10° | 0° |
| | —Sags in Inches— | | | | | | | | | | | |
| 300 | 28.0 | 25.5 | 24.5 | 22.5 | 21.5 | 20.0 | 19.0 | 18.0 | 17.0 | 16.0 | 15.5 | 15.0 |
| 310 | 30.0 | 27.5 | 26.0 | 24.0 | 23.0 | 21.5 | 20.5 | 19.0 | 18.5 | 17.5 | 17.0 | 16.0 |
| 320 | 32.0 | 29.0 | 27.5 | 26.0 | 24.0 | 23.0 | 21.5 | 20.5 | 19.5 | 18.5 | 18.0 | 17.0 |
| 330 | 34.0 | 31.0 | 29.5 | 27.5 | 26.0 | 24.5 | 23.0 | 21.5 | 20.5 | 19.5 | 19.0 | 18.5 |
| 340 | 36.0 | 33.0 | 31.0 | 29.0 | 27.5 | 26.0 | 24.5 | 23.0 | 22.0 | 21.0 | 20.0 | 19.5 |
| 350 | 38.0 | 35.0 | 33.0 | 31.0 | 29.0 | 27.5 | 26.0 | 24.5 | 23.5 | 22.0 | 21.5 | 20.5 |
| 360 | 40.5 | 37.0 | 35.0 | 33.0 | 31.0 | 29.0 | 27.5 | 26.0 | 24.5 | 23.5 | 22.5 | 21.5 |
| 370 | 43.0 | 39.0 | 37.0 | 34.5 | 32.5 | 31.0 | 29.0 | 27.5 | 26.0 | 25.0 | 24.0 | 23.0 |
| 380 | 45.0 | 41.0 | 39.0 | 36.5 | 34.0 | 32.5 | 30.5 | 29.0 | 27.5 | 26.0 | 25.5 | 24.5 |
| 390 | 47.5 | 43.5 | 41.0 | 38.5 | 36.0 | 34.0 | 32.0 | 30.5 | 29.0 | 27.5 | 26.5 | 25.5 |
| 400 | 50.0 | 45.5 | 43.0 | 40.5 | 38.0 | 36.0 | 34.0 | 32.0 | 30.5 | 29.0 | 28.0 | 27.0 |
| 410 | 52.5 | 48.0 | 45.0 | 42.5 | 40.0 | 38.0 | 36.0 | 33.5 | 32.0 | 30.5 | 29.5 | 28.5 |
| 420 | 55.0 | 50.0 | 47.5 | 44.5 | 42.0 | 40.0 | 37.5 | 35.5 | 33.5 | 32.0 | 31.0 | 30.0 |
| 430 | 58.0 | 52.5 | 50.0 | 47.0 | 44.0 | 42.0 | 39.5 | 37.0 | 35.5 | 33.5 | 32.5 | 31.0 |
| 440 | 60.5 | 55.0 | 52.0 | 49.0 | 46.0 | 43.5 | 41.0 | 39.0 | 37.0 | 35.0 | 34.0 | 32.5 |
| 450 | 63.0 | 57.5 | 54.5 | 51.0 | 48.0 | 45.5 | 43.0 | 40.5 | 38.5 | 36.5 | 35.5 | 34.0 |

These sags are such that the unloaded tensions at zero degrees fahrenheit equal approximately one-fifth of the rated breaking strength of No. 135 Wire, for all span lengths shown above.

### TABLE 6 — Long Spans in Light Loading Districts

| Span Length (Feet) | Temperatures in Degrees Fahrenheit | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 110° | 100° | 90° | 80° | 70° | 60° | 50° | 40° | 30° | 20° | 10° | 0° |
| | —Sags in Inches— | | | | | | | | | | | |
| 350 | 35.0 | 32.0 | 30.0 | 28.0 | 26.5 | 25.0 | 23.5 | 22.5 | 21.0 | 20.0 | 19.5 | 19.0 |
| 360 | 37.0 | 33.5 | 31.5 | 30.0 | 28.0 | 26.5 | 25.0 | 23.5 | 22.5 | 21.5 | 21.0 | 20.0 |
| 370 | 39.0 | 35.5 | 33.5 | 31.5 | 29.5 | 28.0 | 26.5 | 24.5 | 23.5 | 22.5 | 22.0 | 21.0 |
| 380 | 41.0 | 37.5 | 35.0 | 33.0 | 31.0 | 29.5 | 28.0 | 26.5 | 25.0 | 24.0 | 23.0 | 22.0 |
| 390 | 43.0 | 39.5 | 37.0 | 35.0 | 33.0 | 31.0 | 29.5 | 27.5 | 26.0 | 25.0 | 24.0 | 23.5 |
| 400 | 45.5 | 41.5 | 39.0 | 36.5 | 34.5 | 32.5 | 31.0 | 29.0 | 27.5 | 26.5 | 25.5 | 24.5 |
| 410 | 47.5 | 43.5 | 41.0 | 38.5 | 36.5 | 34.5 | 32.5 | 30.5 | 29.0 | 28.0 | 27.0 | 26.0 |
| 420 | 50.0 | 46.0 | 43.0 | 40.5 | 38.0 | 36.0 | 34.0 | 32.0 | 30.5 | 29.0 | 28.0 | 27.0 |
| 430 | 52.5 | 48.0 | 45.0 | 42.5 | 40.0 | 38.0 | 35.5 | 33.5 | 32.0 | 30.5 | 29.5 | 28.5 |
| 440 | 55.0 | 50.0 | 47.0 | 44.5 | 42.0 | 40.0 | 37.5 | 35.5 | 33.5 | 32.0 | 30.5 | 29.5 |
| 450 | 57.5 | 52.5 | 49.5 | 46.5 | 44.0 | 41.5 | 39.0 | 37.0 | 35.5 | 33.5 | 32.0 | 31.0 |
| 460 | 60.0 | 55.0 | 51.5 | 48.5 | 46.0 | 43.5 | 41.0 | 38.5 | 37.0 | 35.0 | 33.5 | 32.5 |
| 470 | 62.5 | 57.5 | 54.0 | 50.5 | 48.5 | 45.5 | 43.0 | 40.5 | 38.5 | 36.5 | 35.0 | 34.0 |
| 480 | 65.5 | 60.0 | 56.0 | 53.0 | 50.0 | 47.5 | 44.5 | 42.0 | 40.0 | 38.0 | 36.5 | 35.5 |
| 490 | 68.0 | 62.5 | 58.5 | 55.0 | 52.0 | 49.5 | 46.5 | 44.0 | 42.0 | 39.5 | 38.0 | 37.0 |
| 500 | 71.0 | 65.0 | 61.0 | 57.5 | 54.5 | 51.5 | 48.5 | 45.5 | 43.5 | 41.0 | 39.5 | 38.5 |

These sags are such that the unloaded tensions at zero degrees fahrenheit equal approximately one-fourth of the rated breaking strength of No. 135 Wire, for all span lengths shown above.

## STRINGING SAGS FOR NO. 85 STEEL WIRE (No. 12 B. W. G.)

### BB Iron, H. D. Copper

### TABLE 7 — Heavy Loading Districts — Span Lengths from 100 to 150 Feet In Same Spans with Galvanized BB and Hard Drawn Copper Wires (May also be used in Medium and Light Loading Districts)

| Span Length (Feet) | Temperatures in Degrees Fahrenheit | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 100° | 90° | 80° | 70° | 60° | 50° | 40° | 30° | 20° | 10° | 0° | -10° |
| | —Sags in Inches— | | | | | | | | | | | |
| 100 | 9.5 | 8.5 | 7.5 | 6.5 | 6.0 | 5.5 | 5.0 | 4.0 | 4.0 | 3.5 | 3.5 | 3.0 |
| 110 | 11.5 | 10.0 | 9.0 | 8.0 | 7.0 | 6.5 | 6.0 | 5.0 | 5.0 | 4.5 | 4.0 | 3.5 |
| 120 | 13.5 | 12.0 | 10.5 | 9.5 | 8.5 | 7.5 | 7.0 | 6.0 | 5.5 | 5.0 | 4.5 | 4.5 |
| 130 | 16.0 | 14.0 | 12.5 | 11.5 | 10.0 | 9.0 | 8.5 | 7.0 | 6.5 | 6.0 | 5.5 | 5.0 |
| 140 | 18.5 | 16.5 | 14.5 | 13.0 | 11.5 | 10.5 | 9.5 | 8.5 | 7.5 | 7.0 | 6.5 | 6.0 |
| 150 | 21.5 | 19.0 | 17.0 | 15.0 | 13.0 | 12.0 | 11.0 | 10.0 | 9.0 | 8.0 | 7.5 | 7.0 |

These sags are such that the unloaded tensions at minus 10 degrees fahrenheit equal approximately one-third of the rated breaking strength of BB wire, for all span lengths shown above.

*This Set of*

# BOOKS

Should Be In Every
Telephone Man's Library

## TELEPHONE THEORY and PRACTICE

by KEMPSTER B. MILLER, Consulting Engineer

**VOLUME I**

**Theory and Elements**
*486, pages, 6x9, 272 illustrations,* **$5.00**

**VOLUME II**

**Manual Switching and Substation Equipment**
*439 pages, 6x9, 287 illustrations,* **$5.00**

**VOLUME III**

**Automatic Switching and Auxiliary Equipment**
*494 pages, 6x9, 287 illustrations,* **$5.00**

**ORDER TODAY from**

## TELEPHONE ENGINEER

**7720 Sheridan Road — Chicago**



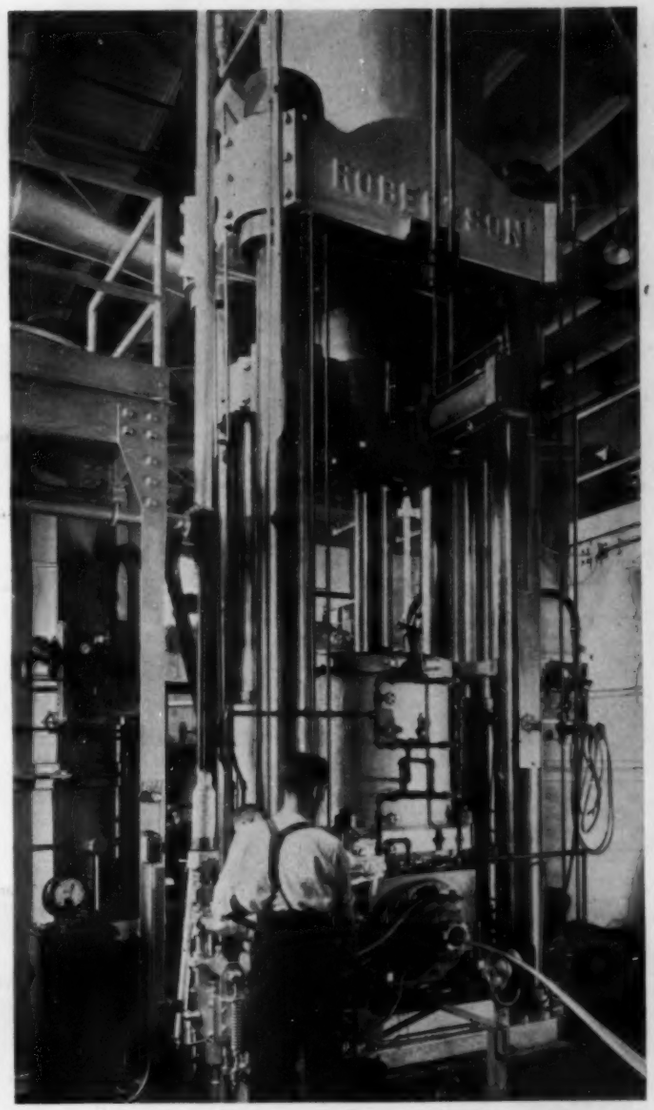
ONE GOOD *Stop* SUGGESTS ANOTHER

ALABAMA
HOTEL ADMIRAL SEMMES ..... Mobile
HOTEL THOMAS JEFFERSON Birmingham
DISTRICT OF COLUMBIA
HOTEL WASHINGTON .... Washington
ILLINOIS
HOTEL FAUST ..... Rockford
LOUISIANA
JUNG HOTEL ..... New Orleans
HOTEL DESOTO ..... New Orleans
MISSISSIPPI
HOTEL LAMAR ..... Meridian
NEBRASKA
HOTEL PAXTON ..... Omaha
NEW MEXICO
HOTEL CLOVIS ..... Clovis
OKLAHOMA
OKLAHOMA BILTMORE . Oklahoma City
HOTEL ALDRIDGE ..... Wewoka
SOUTH CAROLINA
HOTEL WADE HAMPTON ... Columbia

TEXAS
HOTEL ALICE ..... Alice
HOTEL STEPHEN F. AUSTIN ..... Austin
HOTEL SETTLES ..... Big Spring
HOTEL BROWNWOOD .... Brownwood
HOTEL SOUTHERN ..... Brownwood
HOTEL LAGUNA ..... Cisco
HOTEL CORTEZ ..... El Paso
HOTEL TEXAS ..... Fort Worth
HOTEL BUCCANEER ..... Galveston
HOTEL GALVEZ ..... Galveston
HOTEL JEAN LAFITTE ..... Galveston
CORONADO COURTS ..... Galveston
JACK TAR COURT ..... Galveston
MIRAMAR COURT ..... Galveston
HOTEL CAVALIER ..... Galveston
HOTEL PLAZA ..... Laredo
HOTEL LUBBOCK ..... Lubbock
HOTEL FALLS ..... Marlin
HOTEL CACTUS ..... San Angelo
ANGELES COURTS ..... San Antonio
VIRGINIA
MOUNTAIN LAKE HOTEL Mountain Lake

*Affiliated* NATIONAL HOTELS
"HOST TO THE NATION"
SERVING 10 STATES AND OUR NATION'S CAPITAL





## TELEPHONE CABLE
## is no better than its sheath

To maintain unimpaired the desirable electrical characteristics of Phillips telephone cable which result from careful and accurate insulating, pairing and cabling of conductors, the cable is sheathed in a press like that shown above. Under metallurgically correct conditions, a lead sheath of the analysis most suitable for the customer's requirements is applied to the cable. This is one of the ways Phillips avoids cable troubles. May we help you with yours?

## PHILLIPS
## WIRES and CABLES

**General Distributors:**
Canadian Telephones & Supplies Limited
284 King Street, West, Toronto
Branches: Montreal, Brockville, Winnipeg, Regina, Vancouver
Sales Offices: Ottawa, Hamilton, Edmonton

**EXPORT DISTRIBUTORS:**
**AUTOMATIC ELECTRIC SALES COMPANY, LIMITED, CHICAGO**

### *Sag Tables*

BECAUSE of the widely different strength characteristics of ordinary BB iron and the new high strength #85 and #135 steel wire, several sag tables are required to cover the field of use of the several conductor mediums in the three loading districts. These tables which follow are reproduced through the courtesy of the American Steel and Wire Co. and The Indiana Steel and Wire Co. It will be noted that tables #1 to 6 cover the two types of high strength steel wire while tables #7 to 9 cover the use of #85 high strength wire in the same lead with ordinary BB iron or #104 copper wire..

**TABLE 8 — Medium Loading Districts — Span Lengths from 151 to 225 Feet**
**May also be used in Light Loading Districts)**

| Span Length (Feet) | Temperatures in Degrees Fahrenheit | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 100° | 90° | 80° | 70° | 60° | 50° | 40° | 30° | 20° | 10° | 0° | -10° |
| | —Sags in Inches— | | | | | | | | | | | |
| 151 | 18.5 | 17.0 | 16.0 | 14.5 | 13.0 | 12.0 | 11.0 | 10.0 | 9.0 | 8.5 | 7.5 | 7.0 |
| 160 | 21.0 | 19.5 | 18.0 | 16.0 | 15.0 | 14.0 | 12.5 | 11.5 | 10.5 | 9.5 | 9.0 | 8.0 |
| 170 | 23.5 | 22.0 | 20.5 | 18.5 | 17.0 | 15.5 | 14.0 | 13.0 | 12.0 | 11.0 | 10.0 | 9.5 |
| 180 | 26.5 | 24.5 | 23.0 | 20.5 | 19.0 | 17.5 | 15.5 | 14.5 | 13.0 | 12.0 | 11.0 | 10.5 |
| 190 | 29.5 | 27.0 | 25.5 | 23.0 | 21.0 | 19.5 | 17.0 | 16.0 | 14.5 | 13.5 | 12.0 | 11.5 |
| 200 | 33.0 | 30.0 | 28.5 | 25.5 | 23.5 | 21.5 | 19.0 | 18.0 | 16.0 | 15.0 | 13.5 | 13.0 |
| 210 | 36.0 | 33.0 | 31.5 | 28.0 | 26.0 | 23.5 | 21.0 | 19.5 | 17.5 | 16.5 | 15.0 | 14.5 |
| 220 | 39.5 | 36.5 | 34.0 | 30.5 | 28.5 | 26.0 | 23.5 | 21.5 | 19.5 | 18.0 | 16.5 | 15.5 |
| 225 | 41.5 | 38.0 | 35.5 | 32.5 | 30.0 | 27.0 | 25.0 | 23.0 | 21.0 | 19.0 | 17.5 | 16.5 |

These sags are such that the unloaded tensions at minus 10 degrees fahrenheit equal approximately one-third of the rated breaking strength of BB wire for all span lengths shown above.

**TABLE 9 — Light Loading Districts — Span Lengths from 226 to 300 Feet**

| Span Length (Feet) | Temperatures in Degrees Fahrenheit | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 100° | 90° | 80° | 70° | 60° | 50° | 40° | 30° | 20° | 10° | 0° | -10° |
| | —Sags in Inches— | | | | | | | | | | | |
| 226 | 31.5 | 29.5 | 27.5 | 26.0 | 24.0 | 22.5 | 21.0 | 19.0 | 17.5 | 16.5 | 15.5 | 14.5 |
| 230 | 33.0 | 31.0 | 29.0 | 27.0 | 25.0 | 23.5 | 21.5 | 20.0 | 18.5 | 17.5 | 16.0 | 15.0 |
| 240 | 36.0 | 33.5 | 31.5 | 29.5 | 27.0 | 25.5 | 23.5 | 21.5 | 20.5 | 19.0 | 17.5 | 16.5 |
| 250 | 39.0 | 36.5 | 34.0 | 32.0 | 29.5 | 27.5 | 25.5 | 23.5 | 22.0 | 20.5 | 19.0 | 18.0 |
| 260 | 42.0 | 39.5 | 37.0 | 34.5 | 32.0 | 29.5 | 27.5 | 25.5 | 24.0 | 22.0 | 20.5 | 19.5 |
| 270 | 45.5 | 42.5 | 39.5 | 37.5 | 34.5 | 32.0 | 30.0 | 27.5 | 25.5 | 24.0 | 22.0 | 21.0 |
| 280 | 49.0 | 45.5 | 42.5 | 40.0 | 37.0 | 34.5 | 32.0 | 29.5 | 27.5 | 25.5 | 24.0 | 22.5 |
| 290 | 52.5 | 49.0 | 46.0 | 43.0 | 39.5 | 37.0 | 34.5 | 32.0 | 29.5 | 27.5 | 25.5 | 24.0 |
| 300 | 56.0 | 52.5 | 49.0 | 46.0 | 42.5 | 39.5 | 36.5 | 33.5 | 32.0 | 29.5 | 27.5 | 26.0 |

These sags are such that the unloaded tensions at minus 10 degrees fahrenheit equal approximately one-third of the rated breaking strength of BB wire, for all span lengths shown above.

CONSTRUCTION CREWS CHOOSE
DICKE
POLE LINE
TOOLS
Construction men choose Dicke Tools because of their toughness, ruggedness, durability and convenience.
From post-hole digger to pay-out reel you'll find them uniformly satisfactory. There's a complete line waiting to serve your needs—order today.
DISTRIBUTED BY
AMERICAN
AUTOMATIC ELECTRIC
SALES COMPANY
1033 WEST VAN BUREN STREET • CHICAGO, ILLINOIS
BRANCH WAREHOUSES AT DALLAS, KANSAS CITY, LOS ANGELES, RICHMOND (VA.) AND SAN FRANCISCO


**Examination No. 9**

## OPEN WIRE CONSTRUCTION

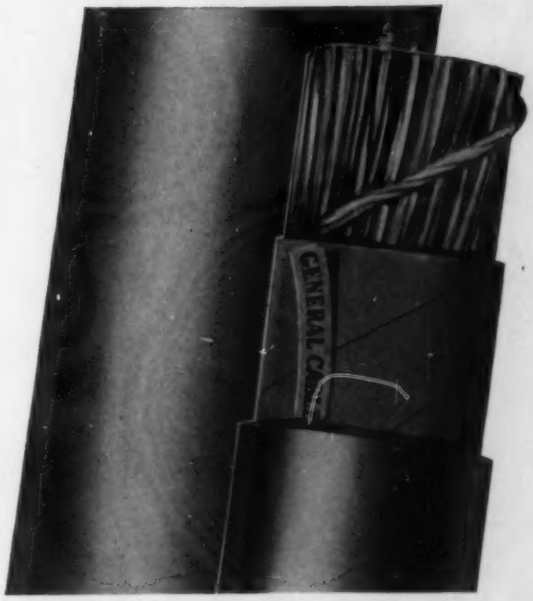
## (Part No. 3)

1. What are the four basic operations in open wire placement?
2. What safety precautions should be taken in wire stringing operations?
3. Describe briefly the two principal methods employed for "pulling out" the wire.
4. Why is the use of a slack equalizer desirable?
5. Of what advantage is a "pulling in" board of the Bell System swivel type?
6. Describe briefly the two "reel set-up" arrangements commonly used.
7. How is sag measured?
8. Compute the tension on a #12 iron wire line having the following characteristics: Span length—200 feet, sag—24 inches, weight of conductor per foot—.033 pounds, diameter of conductor—.0908 feet.
9. What is the correct sag at a temperature of 70° F. for a 250 span of # 85 steel wire in the Medium Loading District (the lead carries only # 85 steel wires)?
10. What is the correct sag at a temperature of 100° F. for # 85 steel wire in the heavy loading district and on a lead that also carries a number of # 109-BB iron and # 104 copper wires. The span length—150 feet.

GENERAL CABLE GENERAL CABLE GENERAL CABLE

# PAPER TELEPHONE CABLES

**Paper for Telephone Cable insulation is selected by General Cable with extreme care. This paper is manufactured by a formula which General Cable research has proven to produce better and more economical Telephone Cable. General Cable's vast experience with paper insulation is another reason why its Paper Telephone Cables remain in the forefront of telephone company preference.**




DISTRIBUTED BY

AMERICAN
AUTOMATIC ELECTRIC
SALES COMPANY

1033 WEST VAN BUREN STREET • CHICAGO, ILLINOIS

BRANCH WAREHOUSES AT DALLAS, KANSAS CITY, LOS ANGELES, RICHMOND (VA.) AND SAN FRANCISCO

WE PROMISE
QUALITY
no matter what!
Despite the heavy demands for materials caused by the Defense Program and, in many instances scarcity, ACORN will NOT sacrifice quality in any of its DROP WIRE shipments to telephone companies. No substitutions unless mandatory and only after careful laboratory control.
THIS IS A PLEDGE!
GUARANTEED
QUALITY
ACORN INSULATED WIRE CO., INC.
225 King Street Cumberland 6-7200 Brooklyn, N. Y.
Chicago Stock
LEICH SALES CORPORATION
427 W. Randolph - Franklin 2931 - Chicago
Cleveland Stock
LINDSAY SUPPLY COMPANY
4815 Superior Ave. - Endicott 0110 - Cleveland

HUBBARD
POLE LINE
HARDWARE
Hefty
Because they are substantially built, Hubbard Pole Line Hardware and Construction Specialty items can withstand brutal punishment.
"Hang The Load On HUBBARD HARDWARE"
DISTRIBUTED BY
AMERICAN
AUTOMATIC ELECTRIC
SALES COMPANY
1033 WEST VAN BUREN STREET • CHICAGO, ILLINOIS
BRANCH WAREHOUSES AT DALLAS, KANSAS CITY, LOS ANGELES, RICHMOND (VA.) AND SAN FRANCISCO

## Virginia Convention

MATERIAL shortage from the present priority status of the telephone industry seemed on every tongue at the annual convention of the Virginia Independent Telephone Association held at the Hotel Roanoke, Roanoke, Va., on October 23rd and 24th. Plant expansion, due to added defense orders, was believed to be most necessary at this time thus requiring an immediate change of the present priority standing.

Elections for the ensuing year were as follows: Dr. George B. Cocke, Manassas, president of the Central Mutual Telephone Co., was made president; the newly elected vice president was W. W. Gibbs IV, commercial manager of the Clifton Forge-Waynesboro Telephone Co., Staunton; and Frank F. LaPrade, general manager of the Lee Telephone Co., Martinsville, was re-elected secretary-treasurer. Directors included: G. R. Gish, auditor of the Bluefield Telephone Co., Bluefield, W. Va., Kelley McNish, president of the Inter-Mountain Telephone Co., Bristol, Tenn.—Va., J. P. Borden, Charlottesville, and T. P. Street, West Point.

The convention got off to a good start with an invocation by B. L. Fisher, president of the Lee Telephone Co., Martinsville and an address by Rodney M. Coggin, vice-president and general manager of the East Coast Telephones, Inc., Warsaw.

Louis Pitcher, of Chicago, executive vice president of the United States Independent Telephone Association presented a speech during the afternoon pertaining to the issuance of government priorities to telephone companies. Following Mr. Pitcher's address was the presentation of a paper by E. W. Olschner, chief engineer of the Carolina Telephone & Telegraph Co., of Tarboro, N. C. In his paper on the "Origin and Functioning of the Coordination Committee" he commented on the fine work done by this committee during the year. A report was also made by R. M. Coggin of Warsaw, general manager of the East Coast Telephones, Inc.

The traffic conference conducted by J. K. Avent of the Home Tel. & Tel. Co., Tarboro, N. C., was held during the Friday morning session. On Friday afternoon there were conferences on accounting, plant and commerce. W. G. Snapp, Inter-Mountain Telephone Co., Tenn.-Va., headed the accounting conference. N. C. Coiner, Clifton-Forge Waynesboro Telephone Co., Clifton Forge, directed the plant conference and presiding at the Commercial conference was C. C. Ward, Charlottesville, general manager of the Virginia Telephone & Telegraph Co.

# *Personals* from the Field

Thanks, **Jim Stoddard,** wire chief of the Fidelity Telephone Co., Sullivan, Mo., for the clipping on the new directory. I'll bet **Cliff Davis,** manager and owner, got a laugh out of the story!

•

**Anton Olson,** 54, owner of the Henry (S. Dak.) Telephone Company, succumbed October 4 to injuries suffered the day before. He was removing wires from the top of a 25-foot pole when it broke at its base and toppled against a building causing him to fall out of his safety strap to the concrete sidewalk. Investigation proved the pole was rotten beneath the surface of the ground.

•

And thanks to **H. O. Cauldwell,** manager of the Chicago office of John A. Roebling's Sons, for his nice comments on our coverage of the P-22 Amended Priorities order in our last issue. Every telephone company in the United States received that issue.

•

**L. P. Ulrich,** district manager of the Central Electric & Telephone Co., Woonsocket, S. Dak., was elected president of the South Dakota Telephone Association during its annual convention in October, succeeding **Harold R. Burr,** owner and manager of the telephone exchange at Faulkton, who was made first vice president. **Robert W. Aszmus,** owner of the Stickney (S. D.) Telephone Company was elected vice president and **Chas. E. Adams,** manager of the Groton-Ferney Mutual Telephone Company was re-elected secretary treasurer.

•

Federal District Court Judge **Thomas Glynn Walker,** Newark, N. J., has resigned his bench to become General Counsel of the New Jersey Bell Telephone Company.

•

**Howard W. Drake,** 63 Brooklyn, N. Y., an executive of the New York Telephone Company died of a heart attack suffered October 3 while on a trip to Bethlehem, Penn. He was Commercial Manager of the Queens division and had a service record of 43 years.

•

**T. Dewitt Talmage,** Communications Engineer for the TVA, Chattanooga, Tenn., and Mrs. Talmadge are receiving congratulations on the birth of a third son. "Ted" will be remembered by TELEPHONE ENGINEER readers for his excellent articles that appeared during past years.

**John H. Agee,** vice president and general manager of the Lincoln (Nebr.) Tel. & Tel. Company, was honored by the Independent Pioneer Telephone Association at its meeting during the National convention in Chicago by being selected as its president. Mr. Agee will make a grand successor to George W. Rodormer who headed the association the year previous.

•

**Norm Shenk,** of Cook Electric, Chicago, is getting quite a name for himself as an amateur photographer. During the state conventions in the Southeast the past few weeks his little black box has been very busy.

(Turn page, please)


**Get Rid of Noise!**
with the Improved
VINCENT RARE GAS RELAY

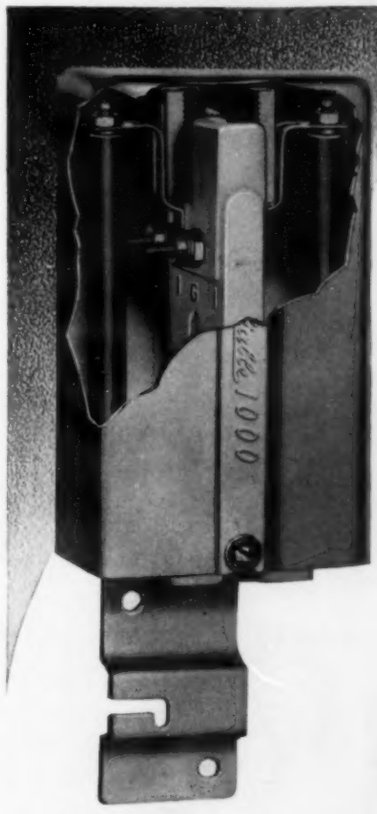
*Installed in a Minute*
*No Moving Parts*
*Thousands in Service*
*Fully Guaranteed*

**Eliminates unbalance noises in metallic party lines employing divided ringing to ground. Works with either harmonic or code ringing.**

**Write for Catalog 39-A describing**
***Non-Grounding Rare Gas Arresters***
***Terminal Strips _ Potheads Housings***

L. S. BRACH Mfg. Corp.
55-63 Dickerson St. Newark, N. J.
*Signal Circuit Engineers Since 1906*






*Request a sample for inspection.*

**SPECIFY *Reliable***
**PROTECTION FOR FUTURE ECONOMY**

**The Reliable No. 1000 Outdoor Protector is time-proved protection against static discharges and power line crosses. It is housed in a sturdy weather-proof, seamless cover. All studs, springs and fuse clips are specially treated to minimize corrosion and eliminate season cracking.**

**Available with various types and lengths of standard telephone fuses and inverted bracket when specified.**

**Approved and listed by the Underwriters' Laboratories.**

*Reliable*
ELECTRIC COMPANY
OVER 30 YEARS SERVICE TO THE UTILITIES
3145 CARROLL AVENUE - CHICAGO, ILLINOIS

The MARK of QUALITY IN REBUILDING SERVICE

**Your Magneto Sets Rebuilt and Converted**

**Only $11.75**

Here's little enough to pay for a telephone that works like new and looks like new.

Equipped with a Monophone handset to give it style and performance, this instrument is your best bet for winning and holding subscribers. Subscribers can't tell it from new. Even you would find it hard without the AR tag to tip you off. If you have no magneto sets to send in, write for prices.

Try Autelco rebuilding and modernizing service soon. It's among the most popular of the many Automatic Electric services to Independent companies.

Distributors in U. S. and Possessions:
AMERICAN AUTOMATIC ELECTRIC SALES COMPANY
1033 West Van Buren Street, Chicago, U.S.A.

AUTOMATIC ELECTRIC

TELEPHONE SIGNALING AND COMMUNICATION APPARATUS


**V. E. Chaney,** president of the Telephone Bond and Share Company, Ft. Wayne, Ind., has been elected a member of the Executive Committee of the U. S. Independent Telephone Association succeeding **E. C. Blomeyer** who retired from that body following many years of service.

•

**Dave Smith,** manager of the Nora Springs, Iowa, branch of the Farmers Mutual Telephone Company, has sent in a report on the completion of their improvements there. Three years of effort to metallize all rural circuits necessitated complete rehabilitation of all lines and most of the poles. Congratulations, Dave!

•

**Jas. N. Cox, Jr.,** president of the Alabama Independent Telephone Association, was very nice to personally invite the writer to their convention. He has stirred up lots of pep among telephone men down there.

•

Kemp Haythorne

**Kemp Haythrone** was at home in the "dugout" of the U. S. Rubber Company during the recent convention as he was an officer and flyer in World War I. He has been selling rubber covered wire to the telephone industry for many years having received his early training in his old home state of Texas. **Kemp** made his first visit to the National convention as a representative of U. S. Rubber since his appointment by that company sometime ago.

•

**Mr. and Mrs. Lee Hayes**, Barling, Ark., have traded their exchange at Barling for the Tuckerman, Ark., exchange with the Southwestern Bell Telephone Company. Barling was near the site of Camp Chaffee and the Army asked the Southwestern to build an exchange large enough to serve their needs.

**Herbert McCulla,** of the Lincoln Tel. & Tel. Company, is a member of the committee of his local Chamber of Commerce to bring Defense industries to Lincoln. He was a recent speaker before the Lions Club.

•

**J. R. Carter** of Perry, Mo. is the new owner of the Silex, Mo. exchange having purchased the property from Dr. W. H. Eberle. This is the fifth exchange Mr. Carter has added to his holdings in Missouri.

•

**John D. Biggs,** chairman of the Illinois Commerce Commission, has been appointed to the executive committee of the National Association of Railroad and Utilities Commissioners.

## Mrs. Mary Wilson Peatross

Mrs. Mary Wilson Peatross, originator of the Peatrophone, died at her home in Sumter, South Carolina on October 14, 1941 following a brief illness. She had been active up until a short time before her death, which came as a great shock to her many friends. She was the originator of the Peatrophone, the mechanical secretary for receiving phone calls in the absence of everyone from the office or home. This interesting invention had its first public showing at Chicago at the 1940 Convention of the United States Independent Telephone Association.

She was born on March 13, 1888 at Wilson Mill, South Carolina and was the daughter of the late Col. and Mrs. Thomas Wilson.

Her father was a very prominent citizen of South Carolina for many years. He operated lumber and turpentine mills throughout South Carolina, Georgia, and Florida on a large scale, farmed very extensively, and in addition to owning a railroad, was a director in the Atlantic Coast Line Railroad Company. Coming to this country as an immigrant from the British Isles, he attained a place of distinction before his death in 1921.

The family moved to Sumter about 1902. Mrs. Peatross attended the College for Women in Columbia, South Carolina and made her home with her parents in Sumter. After their deaths, she married Garnett Peatross on December 23, 1930, who survives her.

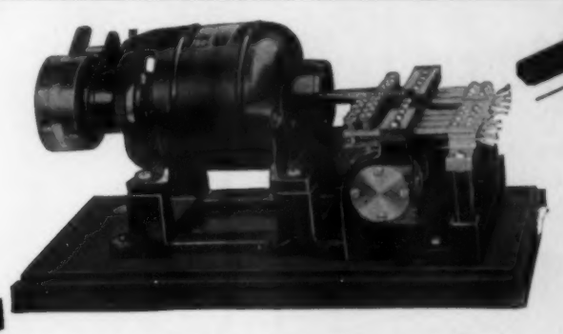
Mrs. Peatross was especially noted for her active work for the Red Cross and other patriotic organizations during the first World War. Although greatly impaired by poor health, she took an active part in Bundles for Britain and Friends of Children in the present war.

## Obituary

**Robert Merritt Matteson,** for the past nine years Vice-President and manager of the Community Telephone Company of Wisconsin, died at Black River Falls, Wisconsin, November 11, 1941, of a heart ailment following a brief illness. He was 62 years old.

Mr. Matteson was born at Joliet, Illinois, August 31, 1879. His great grandfather was Governor of Illinois from 1853 to 1857. He has been in the telephone business 39 years and his first employment was with the Chicago Telephone Company. Later he held the position of Manager with the Tri-City Telephone Company of Clinton, Iowa and also with the Automatic Home Telephone Company of Pontiac, Illinois. In 1922 Mr. Matteson returned to Joliet, Illinois as operating manager of the National Telephone and Electric Company. From 1929 until 1932 he was associated with the Community Telephone Company in Chicago.

Mr. Matteson is survived by his widow, one son, Charles, and grandson, John, of Waukegan Illinois, and two sisters, one residing in Detroit and the other in California. He was a member of the Masonic Lodge, Rotary Club and Independent Pioneer Telephone Association.

**HOLTZER-CABOT**
**MOTOR-DRIVEN INTERRUPTER**

Holtzer-Cabot complete motor driven interrupter equipment combines a method of producing good signaling tones with a means for automatic ringing. Holtzer-Cabot interrupter equipment will:

1. Eliminate slow acting relays.
2. Reduce maintenance.
3. Give positive timing.

AND

4. Is SIMPLE AND DEPENDABLE.

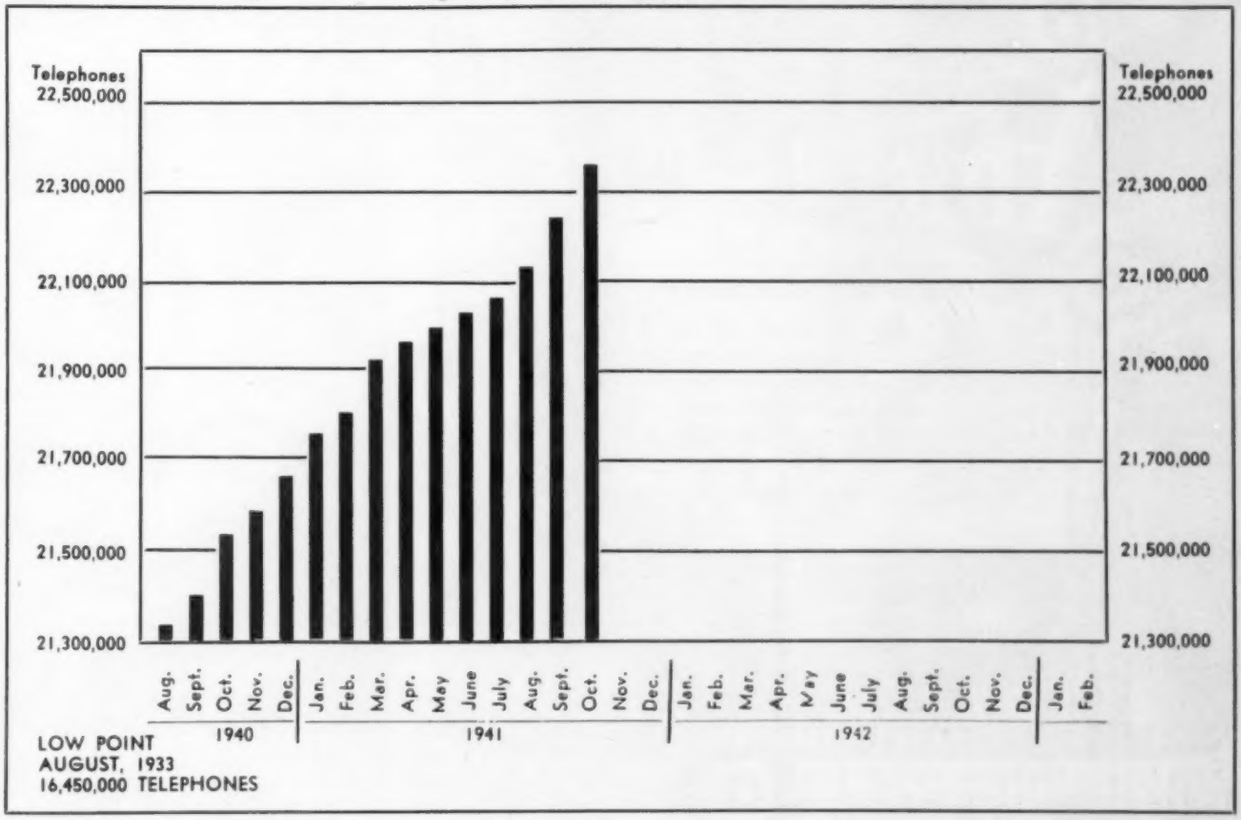
Write for Bulletin 1310-02

125 Amory St. BOSTON, MASS.

*Motor Specialists*

6161 S. State St. CHICAGO, ILL.


# Monthly Telephone Station Barometer



SUB-CYCLE

**Embodies ALL The Desirable Characteristics Of The Ideal Ringing Converter**

Output Capacities 7½ watts to 40/50 watts

**No Moving Parts**
**Nothing to Adjust**
**Economical Operation**
**Quiet**

Six Models for Loads Ranging from the Small PBX to the Large Central Office.

**Also Pulsators**

**Exclusive Features.**

***Facts about Sub-Cycle are yours for the asking.***

**Lorain Products Corporation**
**Lorain, Ohio**
***Sold by Leading Distributors***


# Highlights of Communications News

(Continued from page 18)

in the Uniform System of Accounts for telephone companies. The American Telephone and Telegraph Co. and Bell System filed their comments regarding the commissions' draft of the continued property record in which it was stressed that no excessive and burdensome details on equipment be required. **The Accounting Committee of the U. S. Independent Telephone Association filed its comments Nov. 15. It is deemed likely that the FCC will hold a conference with the telephone industry early next year or possibly in December to iron out any disputed points. At this conference the Independent industry can present its plan of instituting a revenue dividing line between large and small companies to exempt the latter from these accounting requirements.**

### *FCC Activities*

TELEPHONE regulatory activities of the FCC during early November were quite slow. The only important development was the slating of an argument Nov. 24 before the Federal court in Kansas City on the FCC's motion to strike out a number of allegations and statements, made in the court appeal by the Southwestern Bell in the case of FCC jurisdiction over interstate interzone telephone rates in the Kansas City exchange area. The FCC in this case held that it had jurisdiction over interstate rates in a local exchange area and the Southwestern Bell is contesting the Federal commission's jurisdiction over this category of telephone service.

The A. T. & T. received FCC approval to eliminate by acquisition 5 southern state subsidiaries of the Long Lines Department which had been established to conform with state statutes.

## Fred Meade Is the Lucky One

Fred Meade of the Missouri Union Telephone Co. was awarded the little Unique Toolkit blow torch given by the Unique Manufacturing Co., Inc., Chicago, at the recent National Independent Telephone Convention in Chicago. The Unique people tell us they had lots of fun and enjoyed having all the visitors in their exhibit room.

Amertel
. . . . for lower maintenance
The "True-Bonding" process, employed in coating all Amertel line wires with commercially pure zinc, guarantees a faultless bond between steel and zinc. This protection means longer life for the wire and less expense for maintenance of the line.
Next time specify Amertel
Amertel
TELEPHONE AND TELEGRAPH WIRE
AMERICAN STEEL & WIRE COMPANY
DISTRIBUTED BY
AMERICAN
AUTOMATIC ELECTRIC
SALES COMPANY

1033 WEST VAN BUREN STREET · CHICAGO, ILLINOIS
BRANCH WAREHOUSES AT DALLAS, KANSAS CITY, LOS ANGELES, RICHMOND (VA.) AND SAN FRANCISCO

Ed McClure shows us the widest grin snapped at the October USITA convention. He sells Cramer Posture Chairs.

## South Carolina Association Meets For Annual Convention

By H. L. Draper, Sumter, S. Car.

The South Caroline Independent Telephone Association met in Myrtle Beach, S. Car., on November 3 and 4 for one of their most successful annual conventions. Myrtle Beach is an Independent town and is served by the Seacoast Telephone Company.

T. C. Thomasson, Lancaster, S. C., was elected president succeeding F. S. Barnes, Rock Hill. R. S. Durant, Beaufort, was made vice president and H. L. Draper was re-elected secretary-treasurer. The Association re-elected for a three-year term S. L. Bell, Chester, S. C., T. C. Thomasson, and R. S. Durant. Other Directors are L. E. Winget, Sumter, S. C., A. O. Bolen, Swansea, S. C., C. B. Barksdale, Greenwood, S. C., Sam. A. George, Lexington, S. C., F. S. Barnes, and A. G. Trenholm, Georgetown, S. C.

The General Session on the first day was opened by a welcoming address by Mr. F. S. Barnes, President of the Association.

Mr. Barnes reviewed the work of the Officers of the Association and other happenings in the State affecting the Telephone Industry during the past year. He, with other representatives of the Telephone Industry, met in Columbia to form a Telephone and Utility Committee to serve as a Board of Defense for Utility Companies with the Defense Committee. This Committee later met with the Defense Committee to work out plans for the maneuvers now being held in South Carolina and North Carolina. These maneuvers are progressing nicely having some 600 thousand men in the field. These maneuvers have stepped up telephone usage to an unknown peak and the Companies in the area, of which several are Independent Companies, are handling the situation satisfactorily.

Mr. Louis Pitcher, Vice President of the U. S. Independent Telephone Association reviewed the work done by the National Association during the past year and told of the splendid Convention held in Chicago this year.

Mr. S. B. Green of Sumter, S. C., was then introduced and gave an address on "Furnishing Telephone Service to Army Air Base." After this address the meeting broke up into a Traffic Conference and a Plant Conference.

The Traffic Conference was presided over by Mr. R. S. Griffin, Sumter, S. C., assisted by Miss Carrie Mae Jones of Florence, S. C. The meeting was devoted greatly to the operators part in the Defense Program. Some of the operators from Rock Hill, S. C. and Lancaster, S. C., where the maneuvers are in progress, were present and gave first hand information on the problems they faced in rendering service under such unusual circumstances. The air raid flash service was also discussed.

The Plant Conference was presided over by Mr. R. S. Durant of Beaufort, S. C.

Mr. A. O. Bolen, one of the Directors of the Association from Swansea, S. C., discussed the R. E. A. problem in this State. Mr. Green of Sumter, reviewed the "Conversion to Automatic Service". Mr. Green has had wide experience in converting exchanges and gave a step by step review of such a conversion.

The meeting was then devoted to questions and discussions of general telephone problems.

The banquet was most heartily enjoyed. Mr. T. C. Thomasson acted as toastmaster and the principal address was given by the Honorable Claude Sapp, United States District Attorney of Columbia, S. C.

The meeting on the second day was a round table discussion, held on taxes, priorities and other subjects in connection with the present telephone problems. Norman Schenk, a former Director of the Association, was present and took several pictures reproduced in this issue.

*Now--*

**Use Your Old Equipment**

Dig out those old desk sets and signal set parts, and have them refinished and remanufactured into fine quality, clear talking sets.

Such telephones will serve you profitably during the emergency, and can build goodwill for many later years in rural locations.

*See Your Suttle Salesman Catalog for greatest values in this type of service.*

**SUTTLE**
LAWRENCEVILLE, ILLINOIS
EQUIPMENT COMPANY

"That's Good News"

**A REPORT from any department head showing a substantial cut in costs is always "good news" to an executive.**

**Many such reports from Tool Supply Departments follow the adoption of Vacuum Grip Pliers as standard equipment in place of other makes.**

**Instruct your Purchasing Agent to write us for details of Vacuum Grip "high mileage" Economy and our 30-Day Trial Plan.**

**FORGED STEEL PRODUCTS CO.**
Newport, Pa.

**Vacuum Grip Pliers**

PROFESSIONAL LINEMAN PLIERS
The choice of veteran linemen.
Length 6" — $2.00
Length 7" — 2.50
Length 8½" — 3.25
Lineman's or company name etched FREE on handle.

DOWN
GO LINE CLEARING
COSTS

Improved "Telephone" Pruner operating mechanism in head. Rugged, positive cutting power. Perfected spring action. Built for severe service. Two sizes, No. 11 cuts 1" limbs—No. 12 cuts 1½" limbs. Strong, jointed sectional poles to meet all requirements.

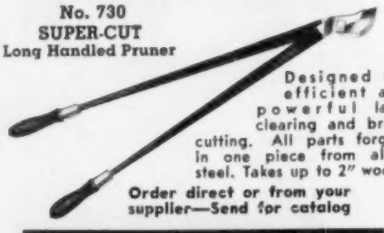
Whether it be original tree clearance or maintenance work—

SEYMOUR SMITH
TOOLS

are preferred by most public utilities because they have for many years proved their ability to stand the gaff, to do any given work better, faster — and that means lower cost clearance operations.

TELEPHONE EXTENSION TREE TRIMMERS
LONG HANDLED PRUNERS—BRUSH CUTTERS
HAND PRUNERS—CABLE CUTTERS
POLE AND HAND PRUNING SAWS

No. 730
SUPER-CUT
Long Handled Pruner



Designed for efficient and powerful land clearing and brush cutting. All parts forged in one piece from alloy steel. Takes up to 2" wood.

Order direct or from your supplier—Send for catalog

SEYMOUR SMITH & SON INC
*Oldest, largest maker of pruning tools*
911 MAIN ST., OAKVILLE, CONN.


# "Danger Live Wires" Movie Produced by Cook Engineers

The Cook Exhibit at the National Convention provided for showing of "Danger Live Wires." Exhibit lights were dimmed by means of theatre dimmers during the fifteen-minute movie.

Because of the unusual interest witnessed at the National Convention in the Cook technicolor sound film "Danger Live Wires," we made inquiries and found that the entire film was produced by the Cook Electric Company engineering staff.

Produced in thirty days and completed on the opening day of the convention, with photography by Roy M. Schultz and Al Wilkins, narration by Marvin Mueller, and script by the Cook Engineering Department, left only the recording of sound and processing of the film to be undertaken by motion picture laboratories.

We also learned that in the course of making accelerated tests of Cook protection equipment, that in addition to the oscillograph records, visual inspection and still photographs of the equipment before and after the test and recording of electrical data, motion pictures are made during the test in order to photograph the various electrical phenomena which occur during the discharge stages. In this manner a permanent slow motion record is recorded showing the action and severity of arcs, discharge of gasses, wire fusing, spontaneous combustion of metals and the breakdown of the equipment being tested.

Because of the unusual photographic effects obtained during a recent series of tests, Cook engineers thought that these effects and results would be of interest to the telephone men generally, and it was therefore decided early in September to prepare a complete motion picture of exhibition during the National convention.

Because the scenes were unrehearsed and were not taken in accordance with a prearranged sequence or script, it was necessary to prepare additional shots showing close ups of equipment, test apparatus, and views indicating conditions now encountered in conjunction with power crosses and related high line hazards, in order to furnish material for a complete picture sequence and script.

During the National Convention this fifteen minute picture was shown 116 times to capacity audiences who evidenced a keen interest in both the commentary and the action.

It was announced that this picture is available for showings at state conventions, district meetings, schools, and plant conferences, and that the Cook Electric Company will make arrangements for sound and projection equipment upon request. We understand that a number of requests have already been received for showings.

Mr. Ivan A. Shaver of Savanna, Ill. (L.) chinning in the Holtzer-Cabot room at the Stevens Hotel with "Smitty" Schmidt, who represents that company.

# 365 DAYS OF SELLING POWER

**Will be Concentrated in the Pages of the**

# 1942 TELEPHONE "BLUE BOOK"

**OF SUPPLIERS AND MANUFACTURERS OF THE VAST TELEPHONE INDUSTRY**

## featuring the Buyer's Guide classified section

MANUFACTURERS AND SUPPLIERS WILL BE LISTED IN THREE WAYS

under—
***"Products Classified"***

under—
***"Trade Names"***

under—
***"Complete Names and Addresses"***

**Goes to All telephone equipment Buyers *as a part of the January issue of –***

**TELEPHONE ENGINEER**
MANAGEMENT · ENGINEERING · MAINTENANCE

## ADVERTISERS

**in this issue will have the advantage of such fact being brought to the readers attention every time their name or products are listed in the BUYERS GUIDE Section.**

**Positive Identification of Property**

More important today than ever before, Premax Pole Markers and Tags of enduring metal are easier and cost less to install than the old-fashioned brush-and-stencil method. Give permanent identification without upkeep coats. Send for samples and prices.

*Premax Products*

Division Chisholm-Ryder Co., Inc.
4210 HIGHLAND AVE. NIAGARA FALLS, N. Y.


# Kellogg Convention Exhibit Noteworthy

Demonstrating units which enabled visitors to make calls through the Kellogg Relaymatic Switchboard and see the calls being completed as they dialed each number. The panel above the switchboard lit up and explained what was taking place as each number was dialed.

Many of the visitors to the recent National Telephone Convention in Chicago were impressed by the extensive and beautiful exhibit of the Kellogg Switchboard and Supply Company. Five rooms were necessary to house the informative and interesting displays.

As a fitting theme at this critical time in our history, Kellogg exhibited a collection of "Americana" diorammas which served as apt reminders of the fundamentals upon which our democracy was founded.

The diorammas, eight in all, illustrated such famous scenes as "The Spirit of '76," "The Statue of Liberty," "The Lincoln Memorial," etc. The beauty of these life-like scenes was enhanced by their location in gold colored frames in the shape of a shield, with spotlights artistically bringing out the vivid natural colors. A booklet containing photographs and historical descriptions of these diorammas was distributed at the convention. A limited supply of these booklets are available and copies may be obtained by writing to Kellogg.

A great deal of interest was displayed in two demonstrating units, one of the Kellogg Relaymatic Switchboard, and the other of Kellogg's new Ringing Filter Equipment. These working models made it easy to understand the operation of the equipment.

Visitors could make calls over the Relaymatic and, could actually trace

This Kellogg demonstrating unit gave a visual and audible comparison of the improved ringing made possible by adding Kellogg's new ringing filter equipment in the ringing circuit.


## Put These Money-Savers On All Your Lines

**HEMINGRAYS** don't tax your operating budget. They actually save money because they outlive poles, hardware and crossarms; "keep up their money-saving efforts for 50 years"— one prominent utility reports.

**85-YEAR OLD** secret glass "batch-mix," plus Owens-Illinois quality-controlled production, results in Hemingrays free of voids, stresses and strains... so homogeneous that sudden changes of temperature leave them unimpaired to work perfectly through sun, rain, hail, snow and sleet.

**LOW IN COST** and long in service-life... sold only by principal jobbers.

*3 Favorites On Rural Lines*

Hemingray Number 42, with its long leakage path keeping "toll" lines trouble free. Number 9, with its fast moisture run-off petticoat and sturdy, all-purpose Hemingray Number 16. Get samples.

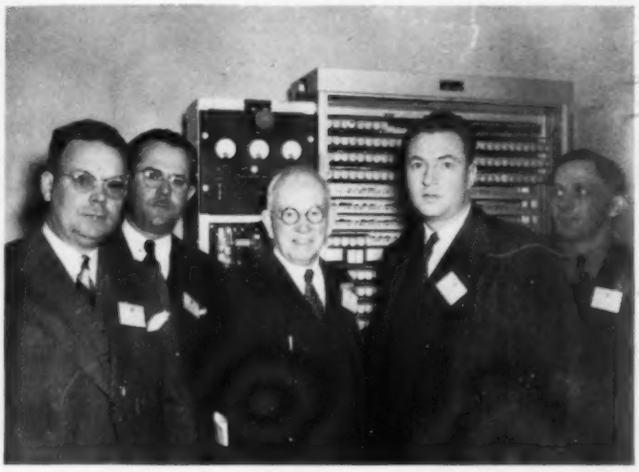
**OWENS-ILLINOIS**

**HEMINGRAY Telephone & Telegraph Insulators • LOWEX Power Insulators**

*Export Agents: International Standard Electric Corp., New York*

the simple, speedy path of their calls through the switchboard. As each number was dialed, corresponding panels above the equipment were lit in succession, explaining clearly what was taking place, in the switchboard, the function of the various relays, etc., until the last number was dialed and the call completed.

The ringing filter demonstrating unit allowed visitors to actually compare rings with and without the ringing filter circuits equipment in operation. In this way they could hear for themselves the better quality ringing made possible by the addition of this equipment in the ringing circuits. Installed in the circuit was an oscillograph, which visibly records the wave forms of the ringing current. This machine showed graphically, how the ringing filter equipment smooths out the ringing wave form, thus making for a more pleasant ring and preventing ring-overs on harmonic ringing circuits. The addition of this equipment will eliminate ringing induction in subscribers cables and thru the switchboard as well as preventing harsh rings in the ear of the subscribers.



TELEPHONE ENGINEER'S camera records a group at the U.S.I.T.A. Convention in the North Exhibit Room; (L. to R.) L. J. Davis and E. O. Link, Galion, Ohio; K. B. Schotte, Kittanning, Pa.; H. C. Ryon, Galion; H. D. McKee, Innis, Mont.

## North Elec. Displays Plastic Models

The North Electric Mfg. Company's exhibit emphasized an attractive display of telephone instruments.

Particular stress was placed upon this Company's preparation for the use of plastics should it become impossible to obtain the necessary metals for the manufacture of telephones. Dials with POLY-STYRENE fingerwheels were an impressive part of the display. North engineers expressed themselves as being of the opinion that POLY-STYRENE is quite possibly a material better adapted to dial wheels than metal. It was explained that the transparency of the plastic permits better illumination of the number plate and that the plastic is impervious to atmospheric or body corrosive substances.

A plastic base for the North handset desk telephone was also exhibited as a possible eventual substitute for the present base which is made of die cast malleable metal. The plastic bases are of the same general dimensions, although with thicker walls, as the metal base and are interchangeable.


"UNIQUE"
No. 3 BLOW TORCH
—For Cold Windy Weather

Flame 1x7"-2000° F.
Long Life Generator
Automatic Cleaning Needle

Cool Bakelite Wheel
Removable Channel Plugs

Welded Steel Tank
Hundreds of Hours Efficient Service

Folding SAFETY Shield
Protects Splicer, Public & Furnace
Folds Flat for Carrying

No. 50 as shown

No. 50A 4 sided no grate

No. 50C 3 sided no. grate

No. 5C

Unique Mfg. Co., Inc.
221 W. Walton St.
CHICAGO, ILL.

BRACKETS-OPEN FOR PERMANENT POSITIONS
If you want brackets that you can put to work and promptly forget—these sturdy oak fellows are the ones to employ.
RAINIER
AMERICAN CROSSARM and CONDUIT COMPANY
DISTRIBUTED BY
AMERICAN
AUTOMATIC ELECTRIC
SALES COMPANY

1033 WEST VAN BUREN STREET • CHICAGO, ILLINOIS
BRANCH WAREHOUSES AT DALLAS, KANSAS CITY, LOS ANGELES, RICHMOND (VA.) AND SAN FRANCISCO

# The Clearing House

## For the convenience of readers of Telephone Engineer


**LOOMIS ADVERTISING CO.**

A SALES ORGANIZATION *Exclusively..*

**That Has Never Failed to Produce More Net Revenue (All Costs Considered) for Telephone Companies Served.**

IF INTERESTED in more net telephone directory revenue write or call at our expense.

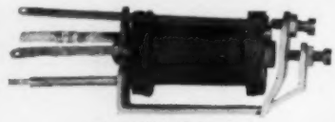
**LOOMIS ADVERTISING CO.**

Telephone Bldg., Kansas City, Mo.

Citizens Trust Bldg., Fort Wayne, Ind. — 135 So. Second St., Philadelphia, Pa.



**Reconditioned W. E. CO. LINE RELAYS**



No. 189-D type

Mfgs. for above relays
711-A for 20 relays
717-A for 25 relays

*Write for prices!*

**Buckeye Telephone & Supply Company**
COLUMBUS, OHIO


**Statement of the Ownership, Management, Circulation, Etc., Required by the Act of Congress of March 3, 1933,**

of Telephone Engineer, published monthly at Pontiac, Illinois, for October 1, 1941.

State of Illinois, County of Cook, ss.— Before me, a notary public in and for the State and county aforesaid, personally appeared Ray W. Smith, who, having been duly sworn according to law, deposes and says that he is the business manager of the Telephone Engineer, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc, of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, as amended by the Act of March 3, 1933, embodied in section 537, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are:

Publisher—Telephone Engineer Publishing Corp., Chicago, Illinois.

Editor—Ray W. Smith, 7720 Sheridan Road, Chicago, Illinois.

Business Managers—Ray W. Smith & Roy F. Smith, 7720 Sheridan Road, Chicago, Illinois.

2. That the owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company, or other unincorporated concern, its name and address as well as those of each individual member must be given.)

Telephone Engineer Publishing Corp., Chicago, Illinois.

Ray W. Smith, 7720 Sheridan Road. Roy F. Smith, 7720 Sheridan Road.

3. That the known bondholders, mortgagees, and other security holders owning or holding one per cent or more of total amount of bonds, mortgages or other securities are: (If there are none, so state.)

Estate of J. A. Smith. 7720 Sheridan Road.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

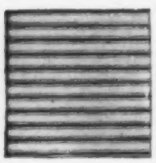
RAY W. SMITH,
Business Manager.

Sworn to and subscribed before me this 1st day of October, 1941.

(My commission expires Sept. 1, 1943)
(Seal) W. R. DAVIS,
Notary Public.


**CABLE-SPLICERS WIPING CLOTHS**

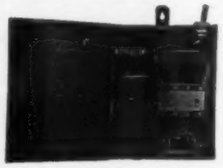
Formed-flexible finishing cloths (Patented); Flat finishing cloths; Catch cloths; Crotch cloths and Up-right joint catch cloths. Made of world-prize HERRINGBONE TICKING or imported English MOLESKIN. All-ready for use. Require no breaking-in. Ask for "Williams."



**GEO. E. WILLIAMS, Mfr.**
3035 ALDRICH AVENUE, MINNEAPOLIS, MINN.


### *Battery Eliminators*


**THE NEW ELECTROX**
Battery Eliminator — Type PA-05004



**$16.85**

Complete with power-off relay. Output for two operators' sets. Mount; connect two leads to operator's terminal; plug in cord. Presto! no more battery problem! Sent on trial. Write for Cir. 373.

**ELECTROX** 2060-68 Reading Road
A Schauer Product CINCINNATI, OHIO


### *Telephone Engineers*


**J. G. WRAY & CO.**
Telephone Engineers
Specialists in Appraisals, Rate Surveys, Financial Investigations, Organization and Operation of Telephone Companies
105 West Adams Street
CHICAGO



**J. W. WOPAT**
CONSULTING ENGINEER
Telephone Engineering — Construction Supervision — Appraisals — Financial — Rate Investigations
1510 Lincoln Bank Tower
Fort Wayne, Indiana


### *Cedar Poles*


*Carney*
CEDAR POLES
Plain or Butt Treated
B. J. CARNEY & CO.
100 No. 7th St. Minneapolis



Finished Cedar Poles
VALENTINE CLARK CORPORATION
St. Paul, Minn.


### *Toll Tickets*


**TOLL TICKETS**
30,000 1A Out, one carton, news stock, loose, 15c a thousand. On bond paper 25c a thousand.
*Write For Our Catalog Of Printed Supplies*
**TELEPHONE PRINT CO.**
125 W Washington St. Napoleon, Ohio